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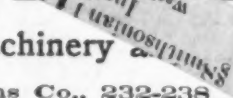
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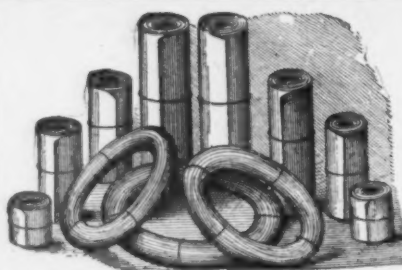
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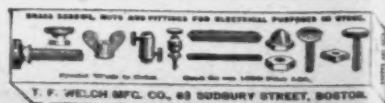
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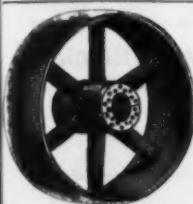
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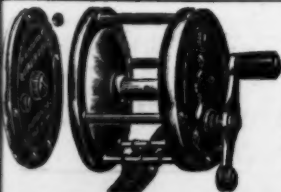
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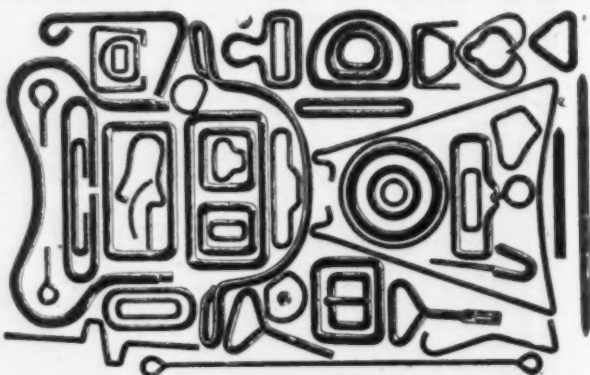
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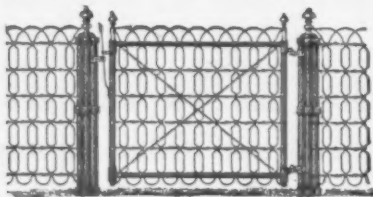
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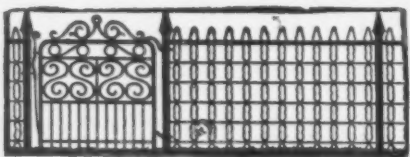
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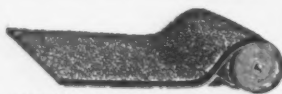


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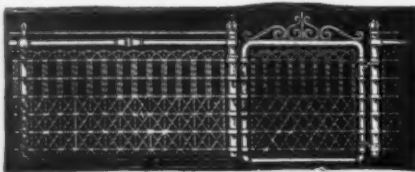
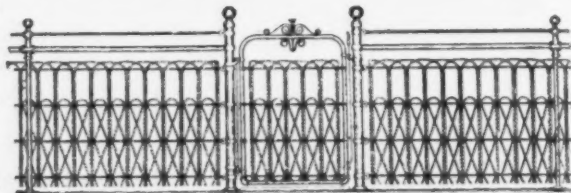
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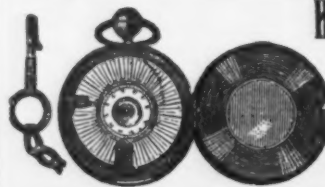
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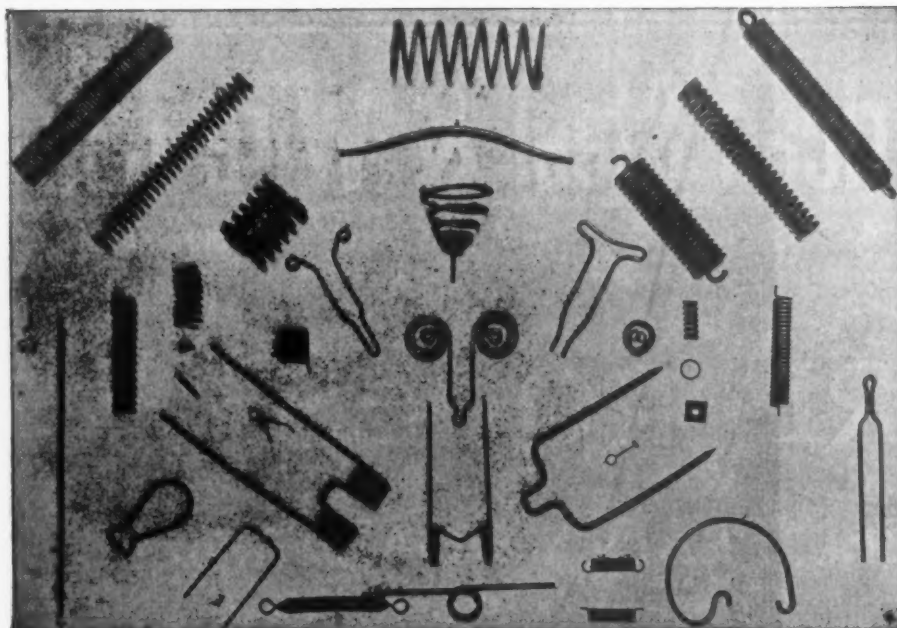
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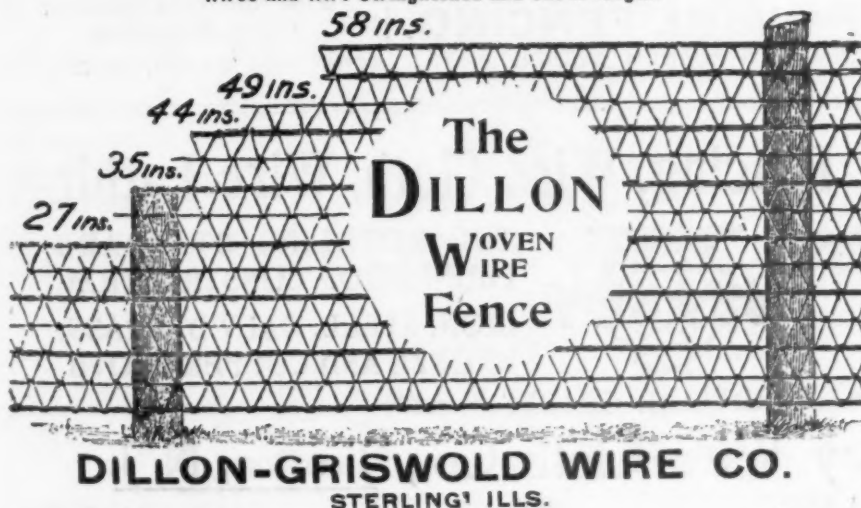
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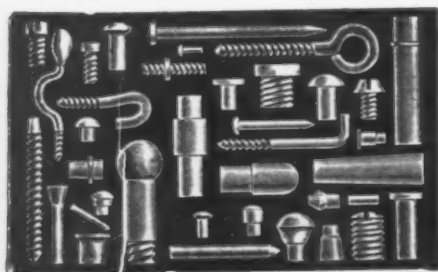
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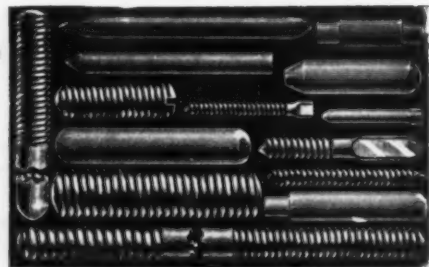
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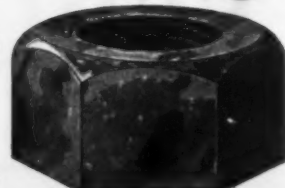
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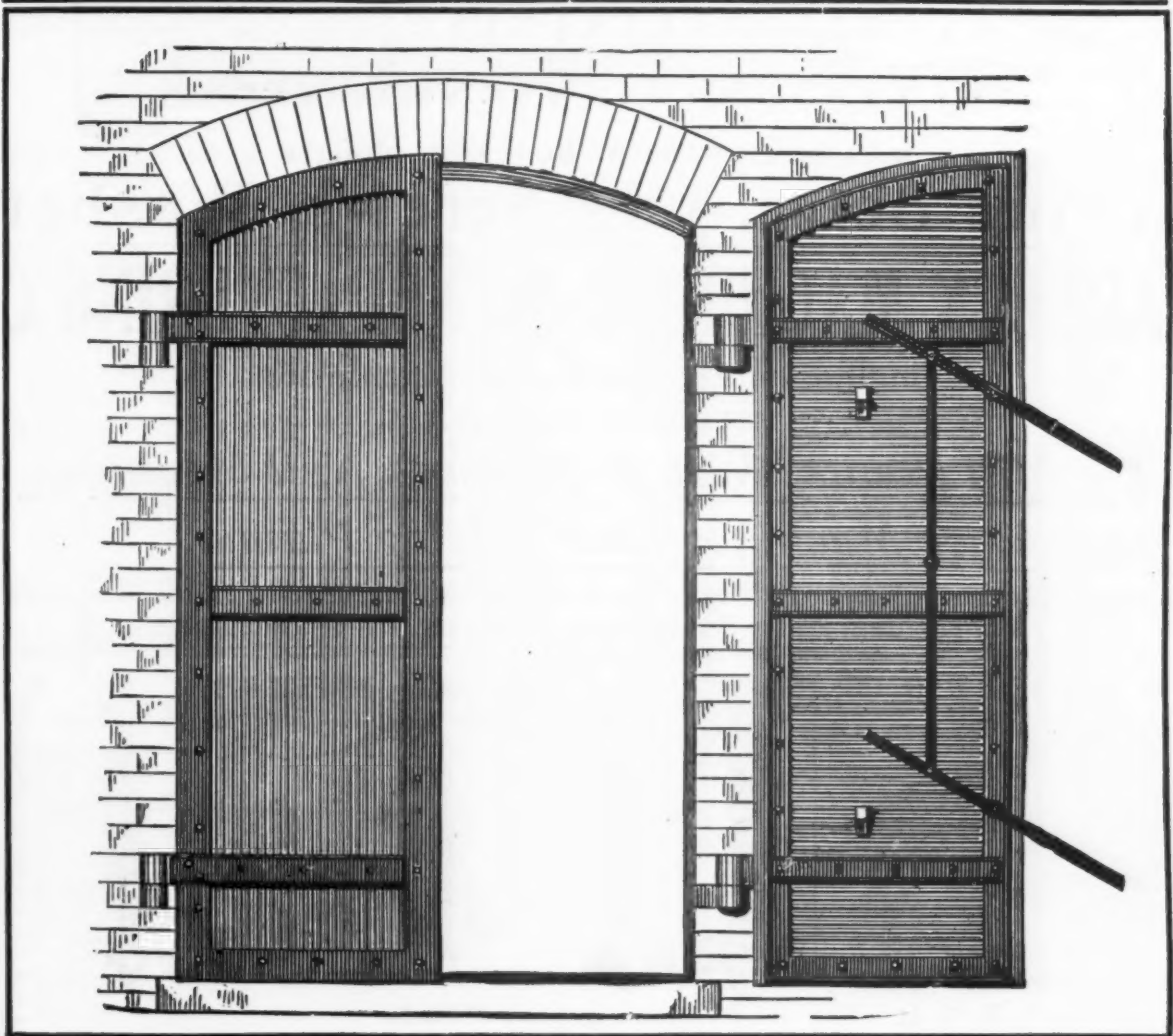
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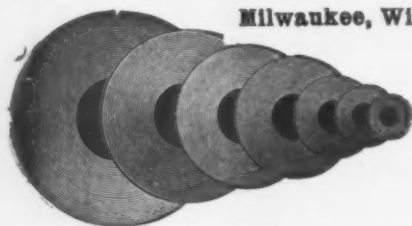
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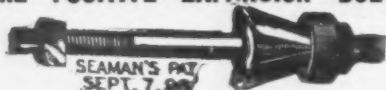
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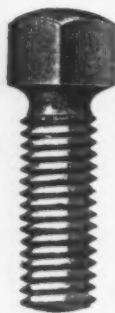
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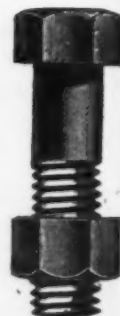


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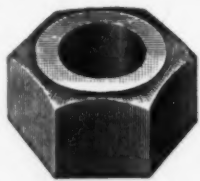
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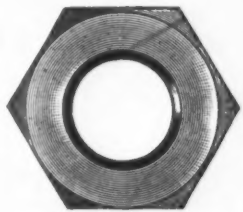
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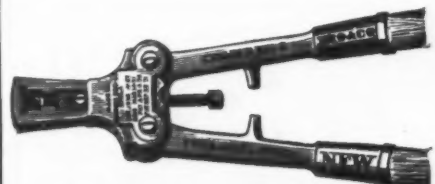


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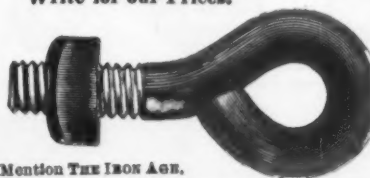
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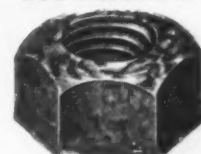
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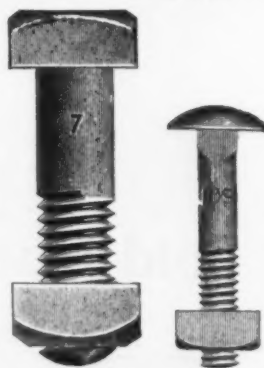
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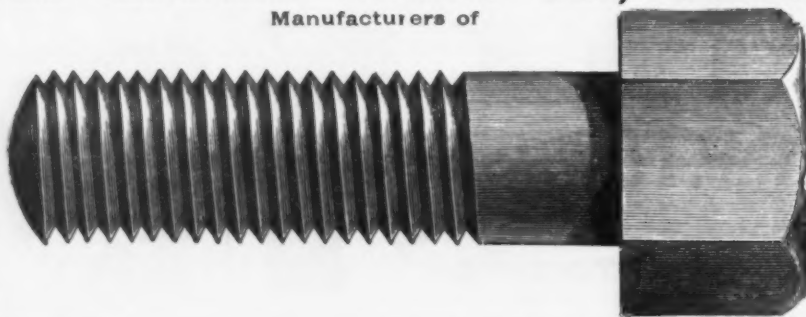
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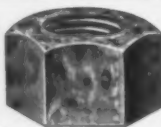
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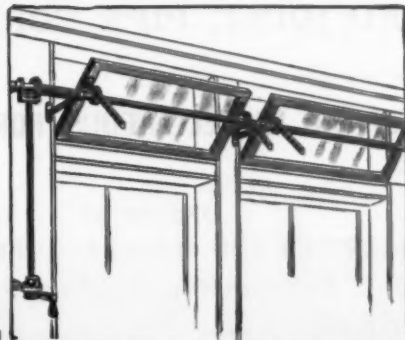
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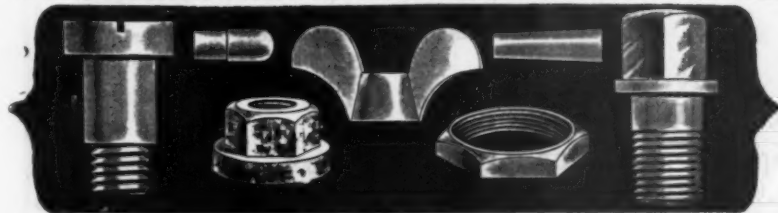


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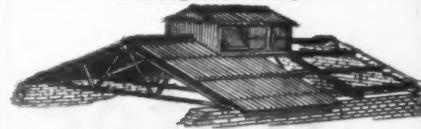
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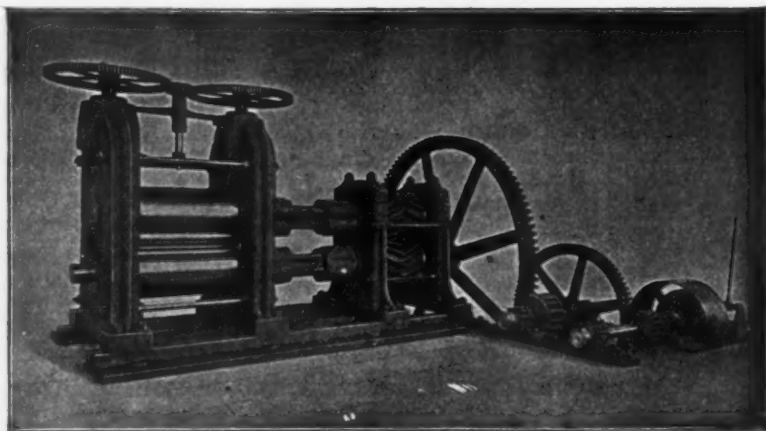


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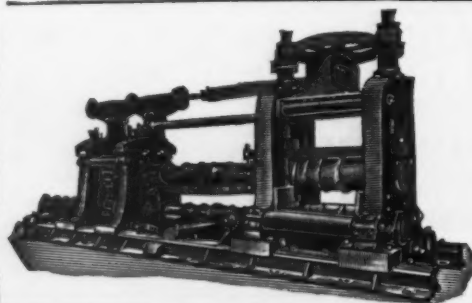
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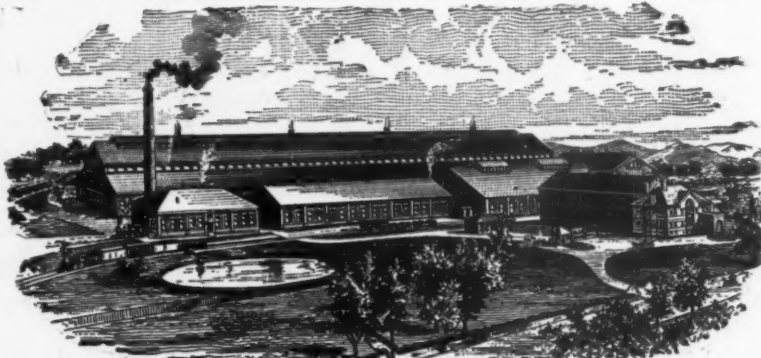
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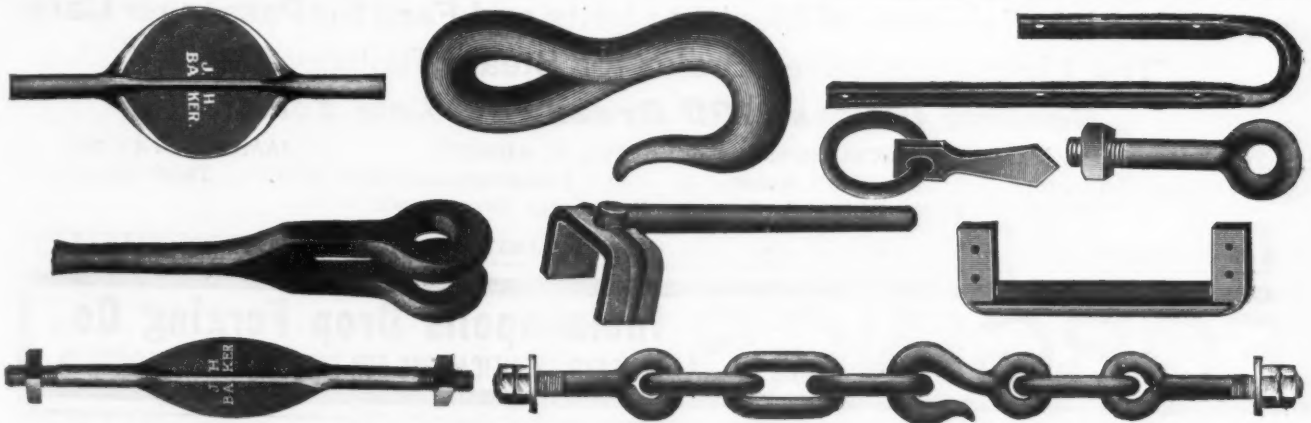


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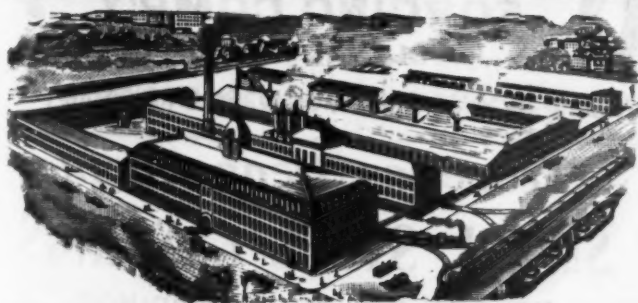
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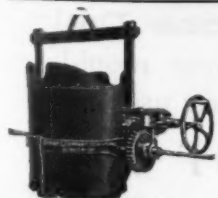
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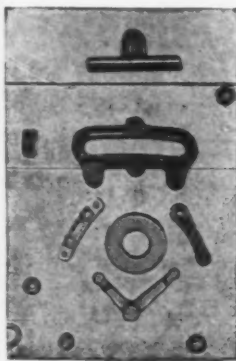
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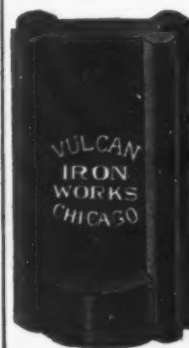
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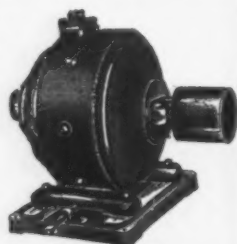
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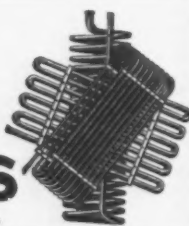
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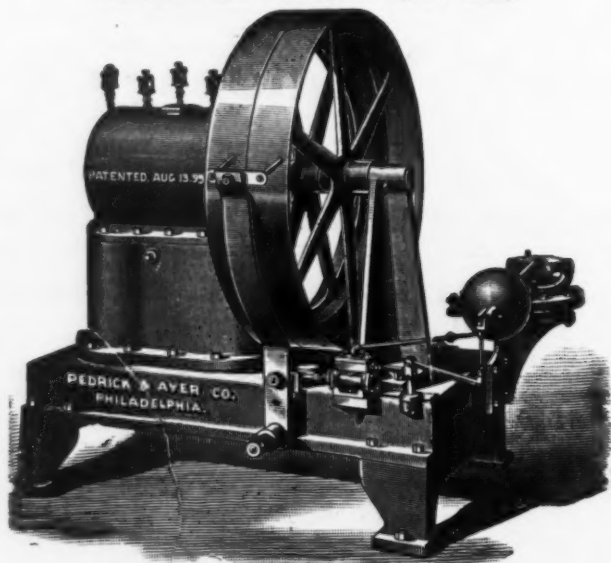
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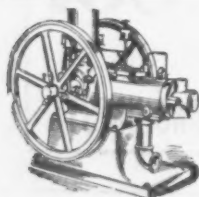
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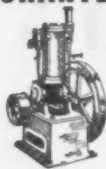
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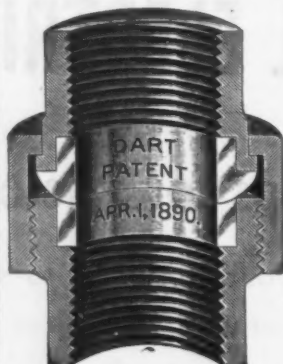
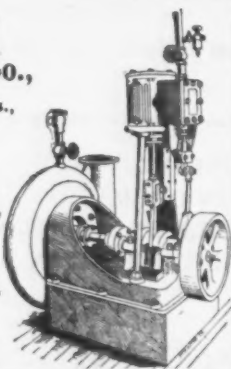


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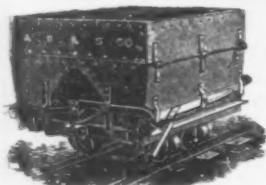
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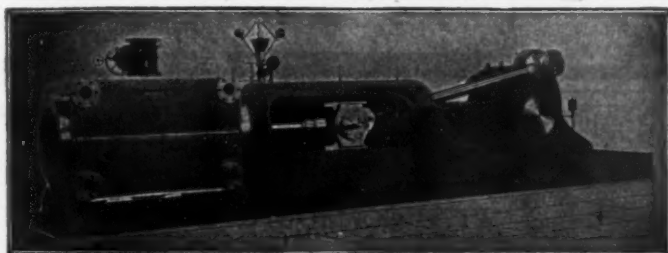


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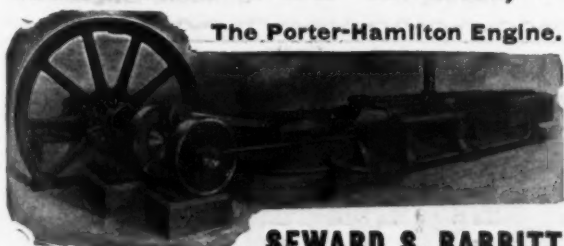
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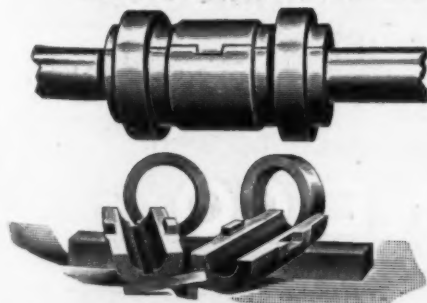
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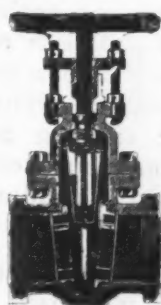
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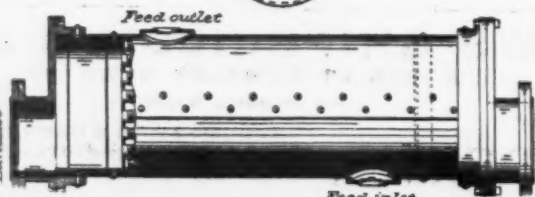
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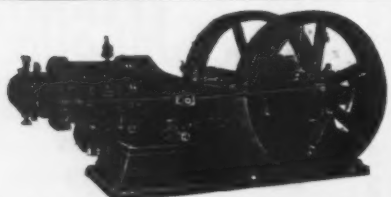
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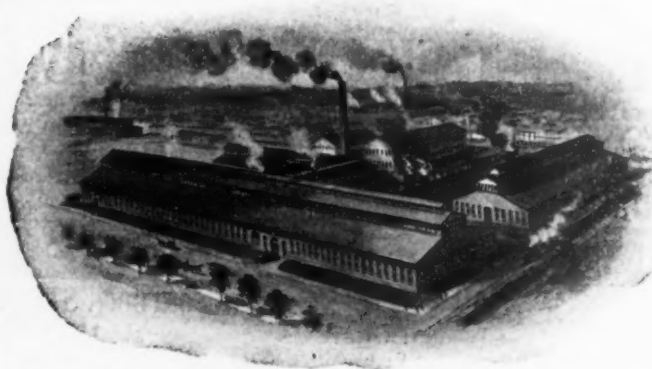
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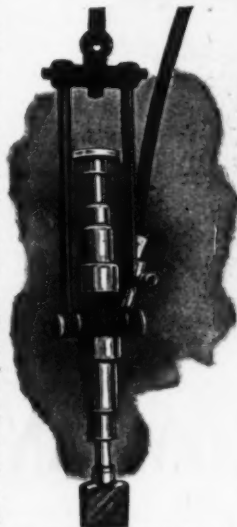
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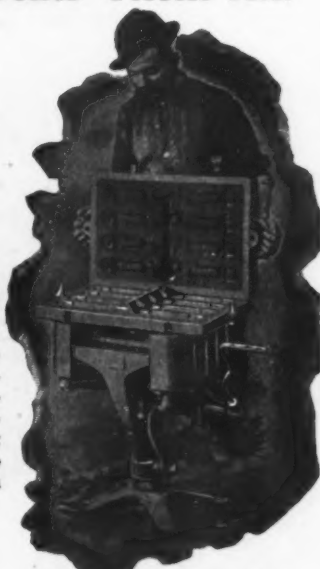
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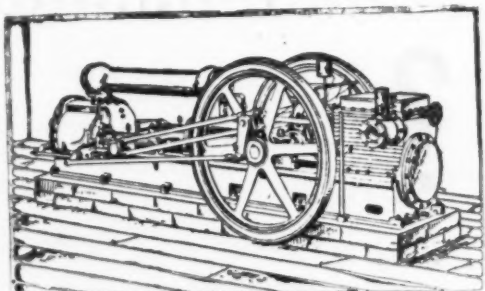
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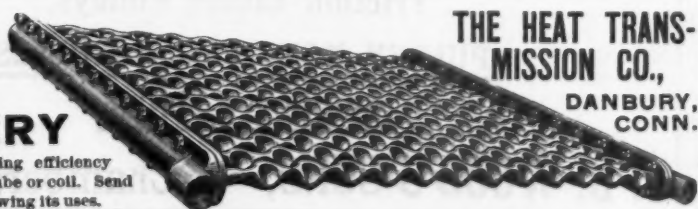
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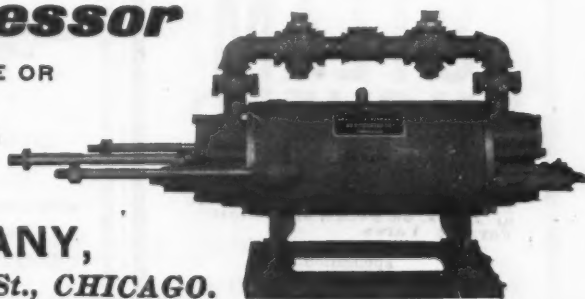
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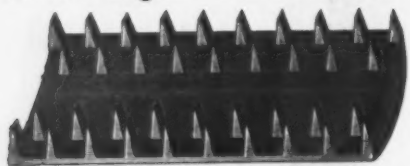
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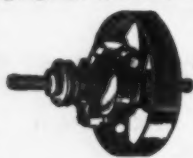
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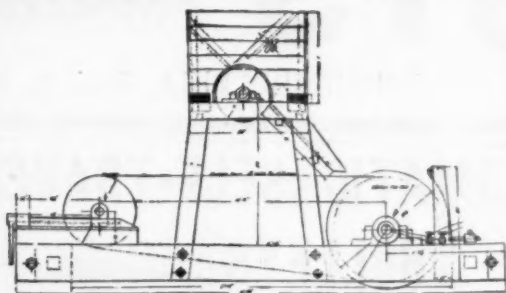
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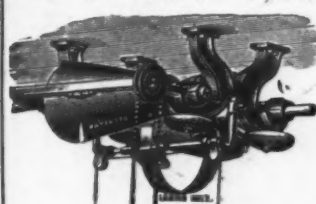
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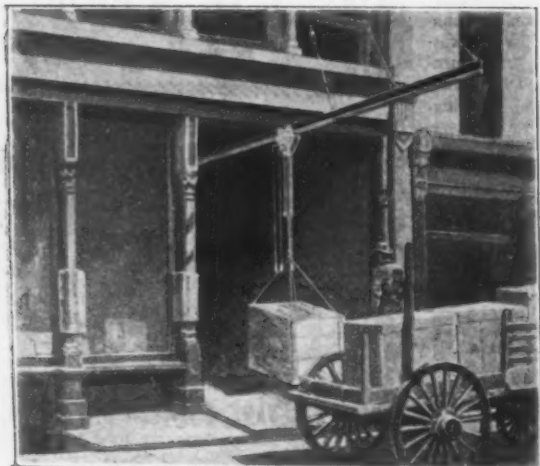
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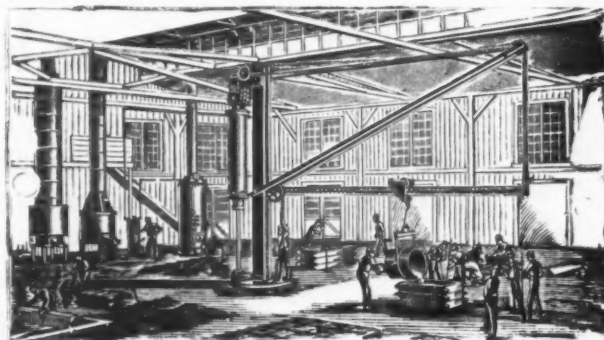
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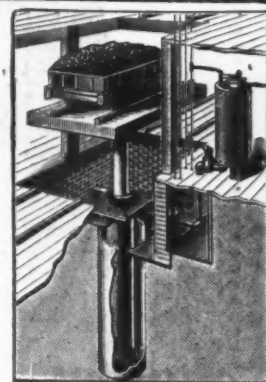
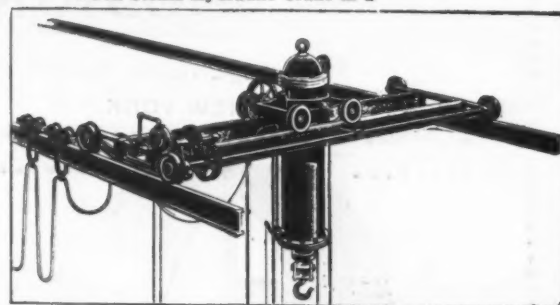
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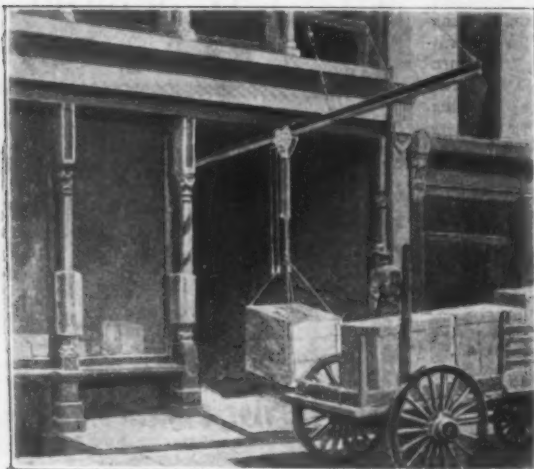
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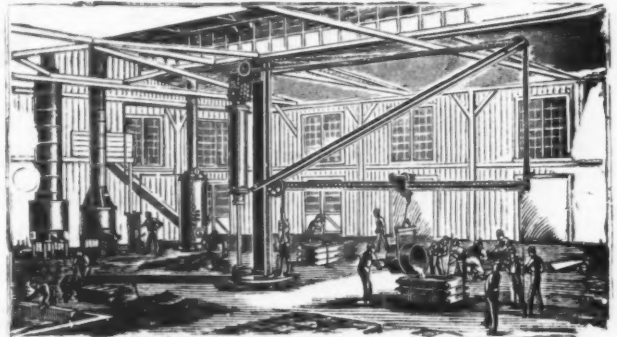
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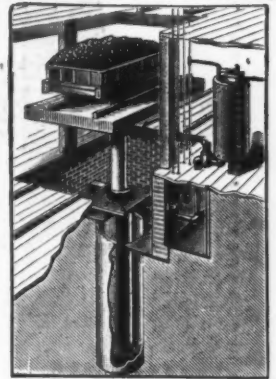
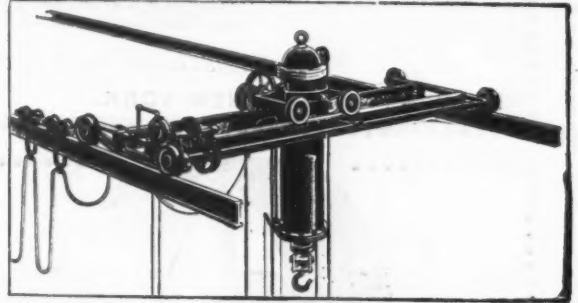
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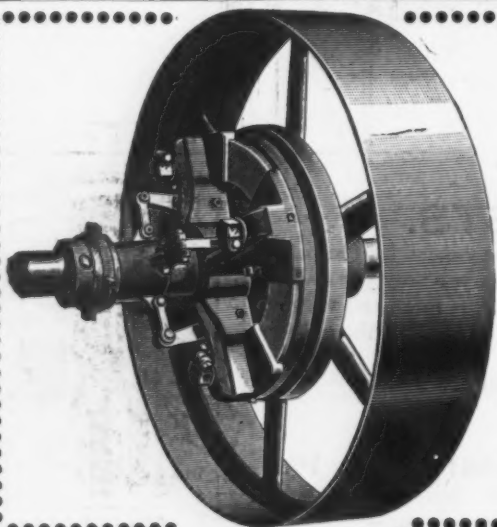
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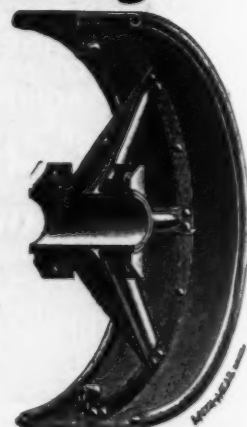
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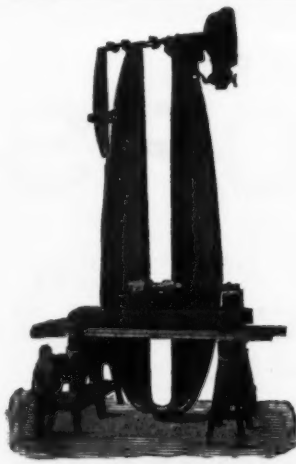
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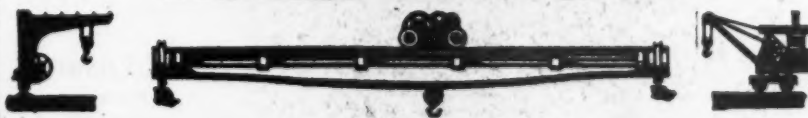
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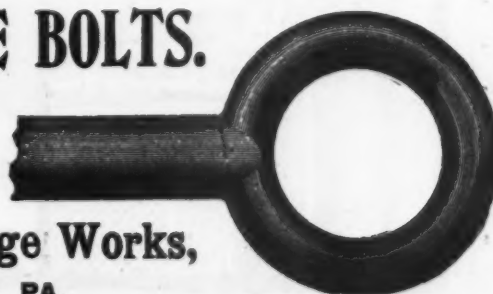
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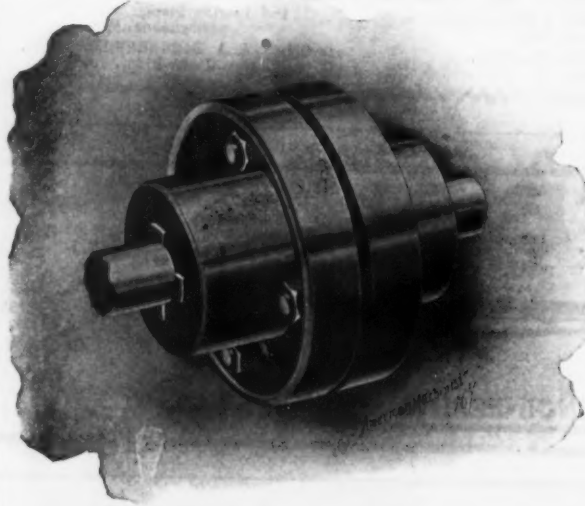
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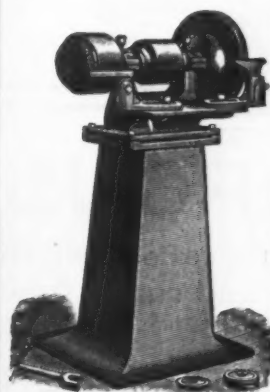
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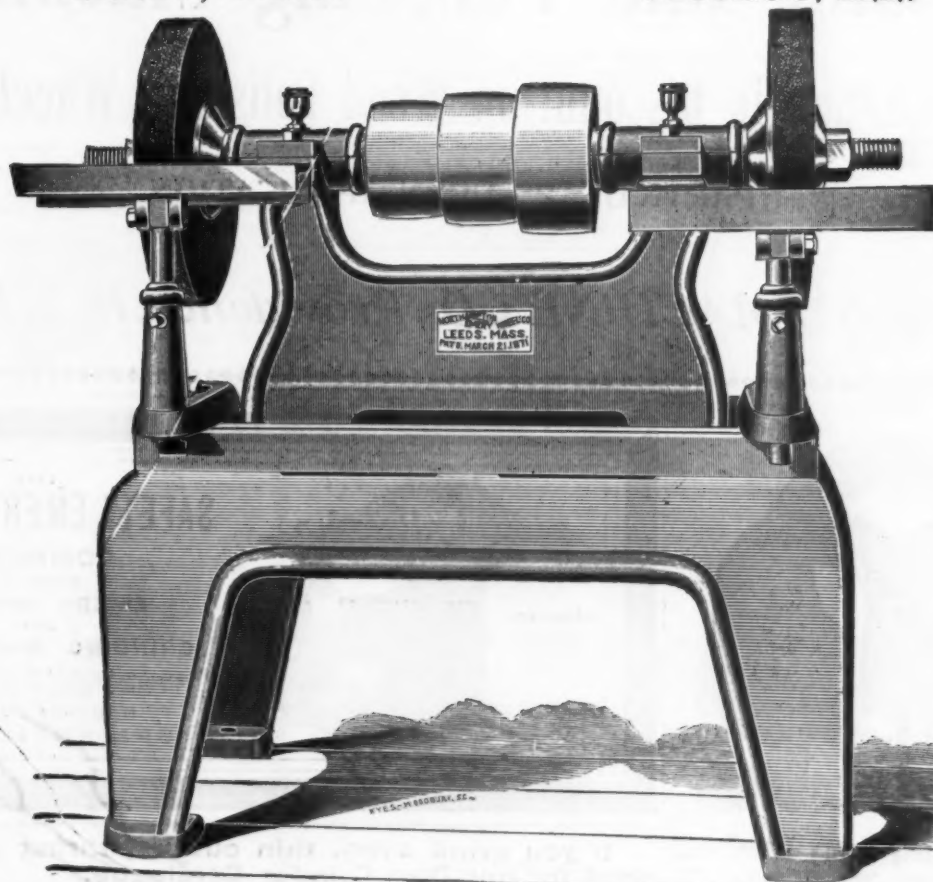
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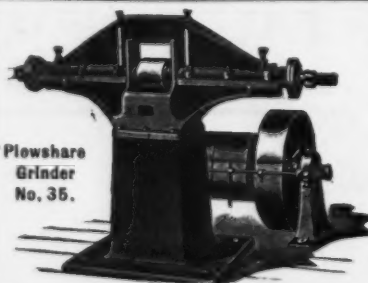
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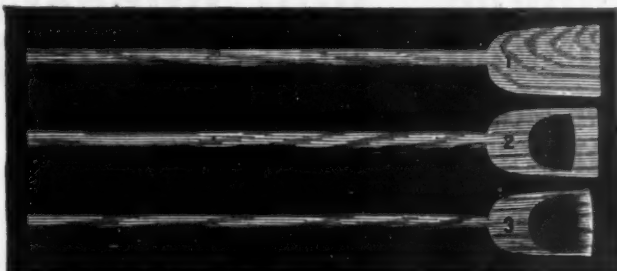
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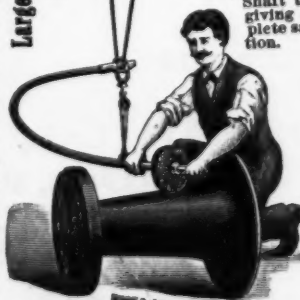


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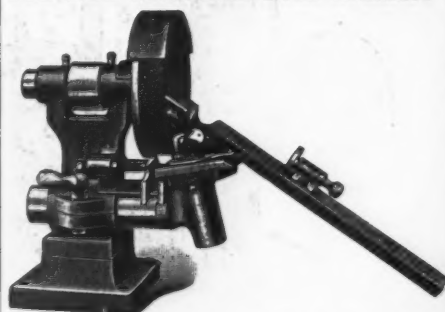
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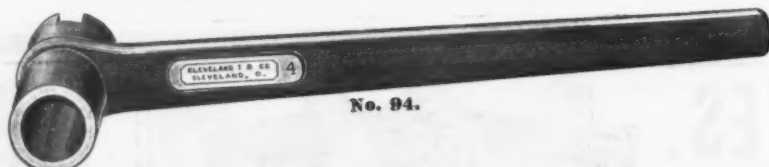
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THE MOST ADVANCED AND FINEST  
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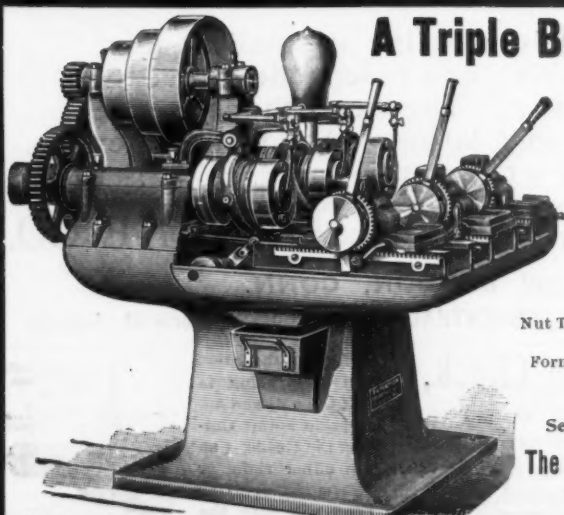
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Each Chuck..... \$2.50

Arbor for Center Drill Chuck, without nut..... .80



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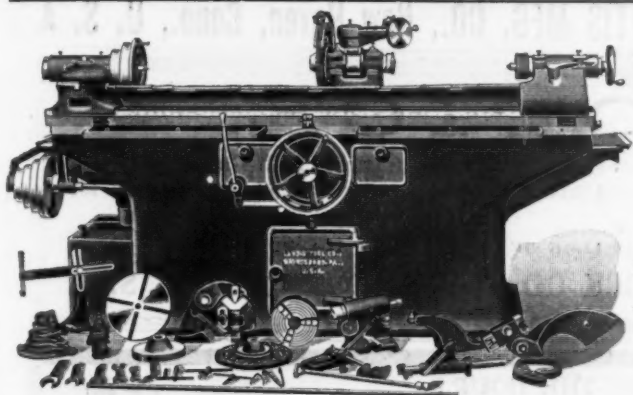
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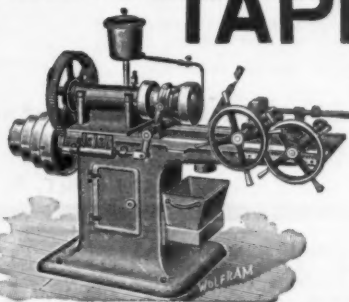
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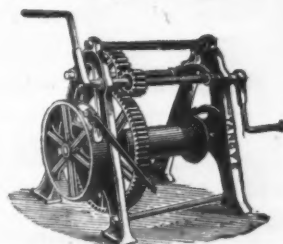
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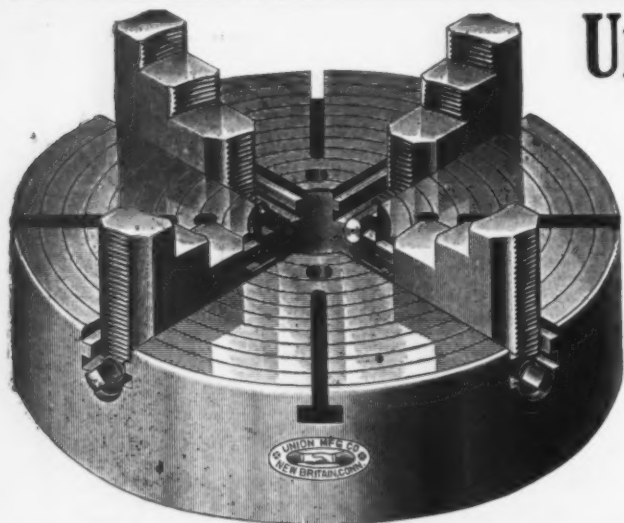


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MADE IN THE FOLLOWING SIZES:

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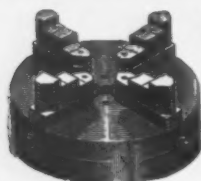
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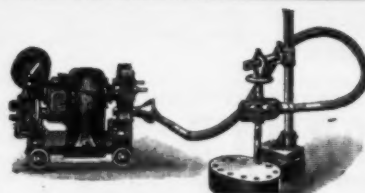


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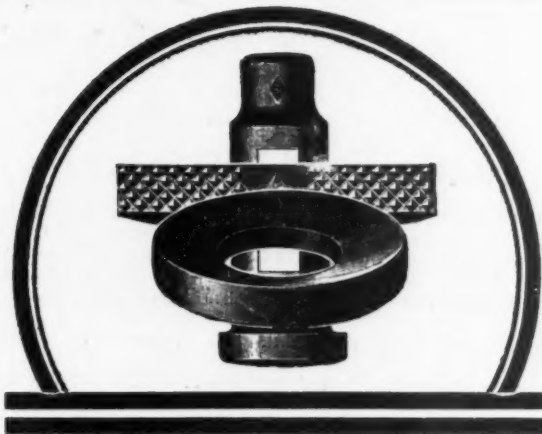
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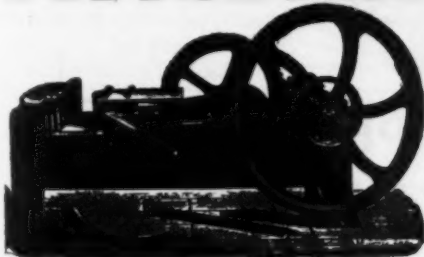
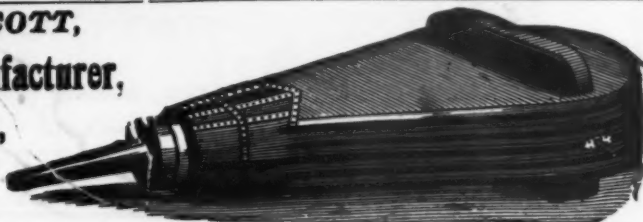
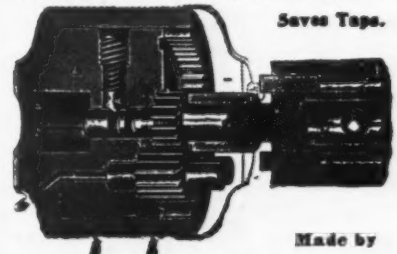
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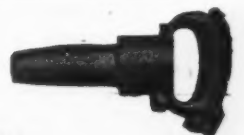
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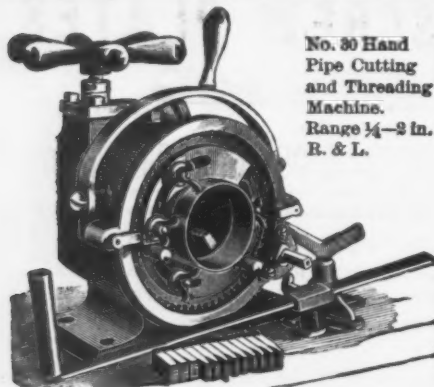
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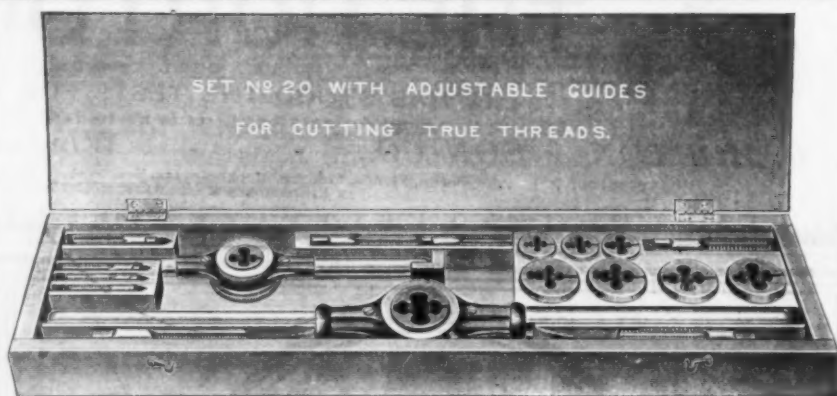
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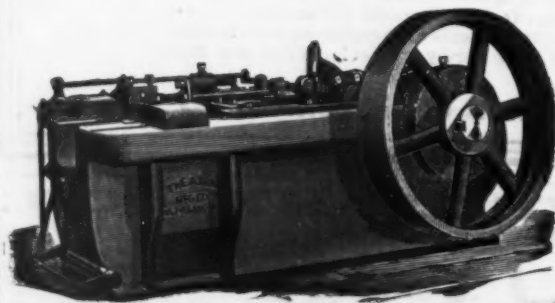
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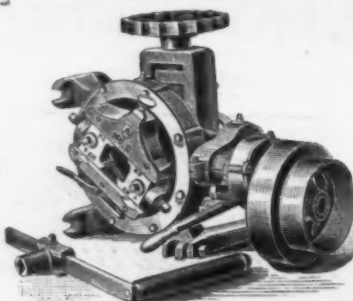
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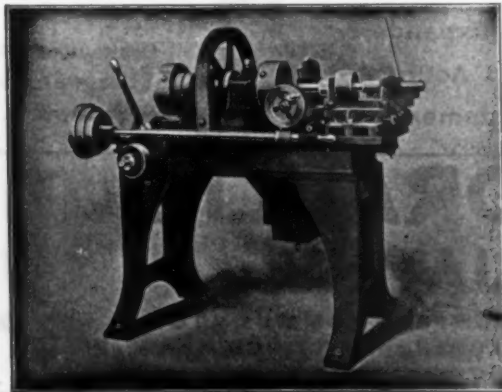
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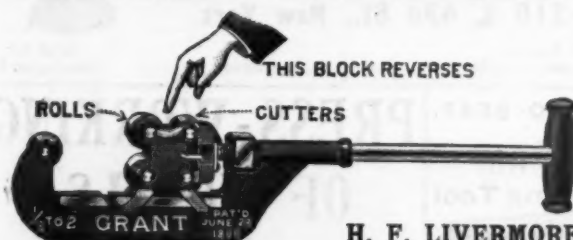
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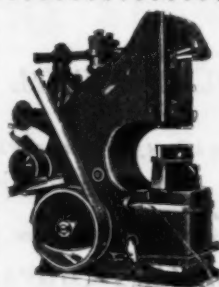
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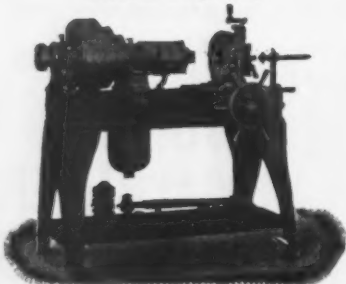
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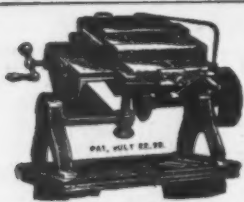
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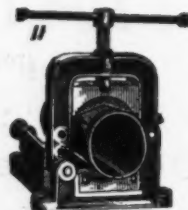
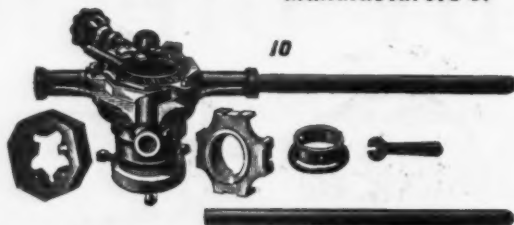
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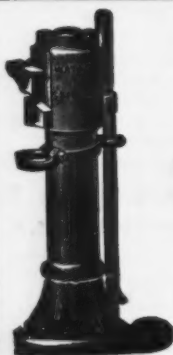
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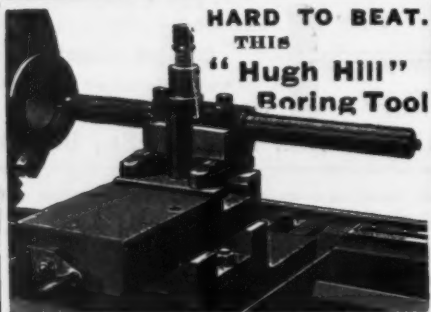
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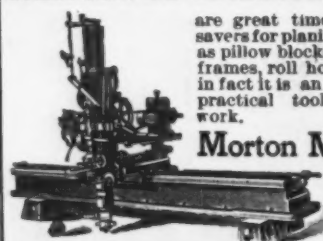
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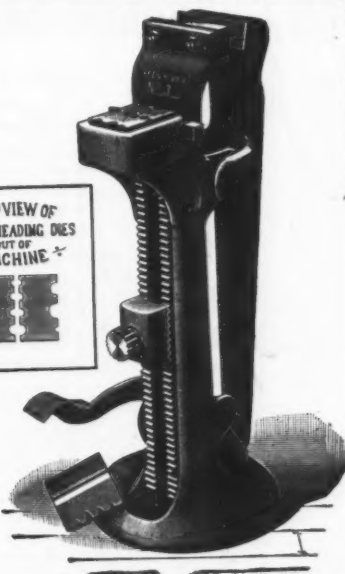
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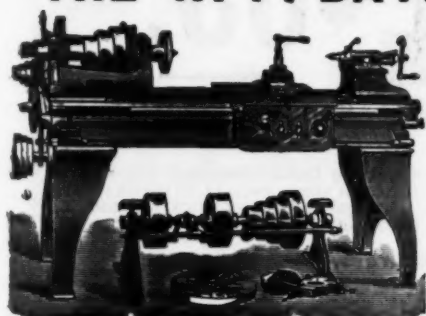
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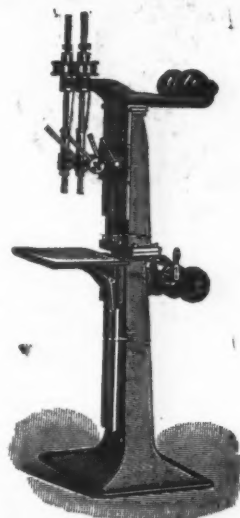
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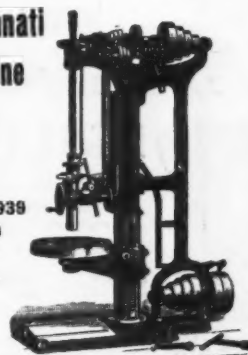
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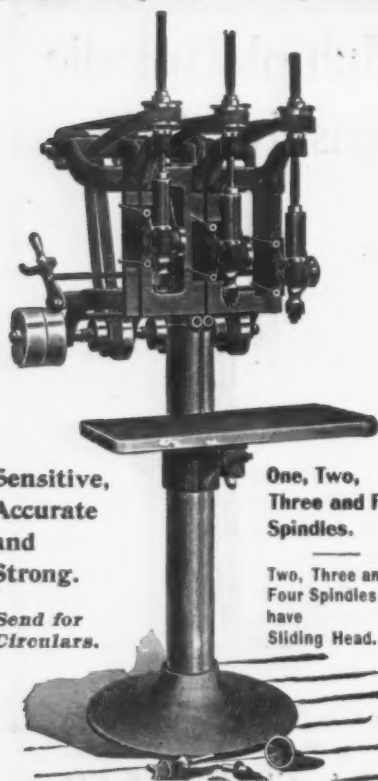
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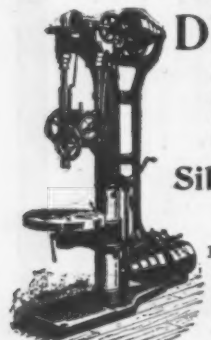
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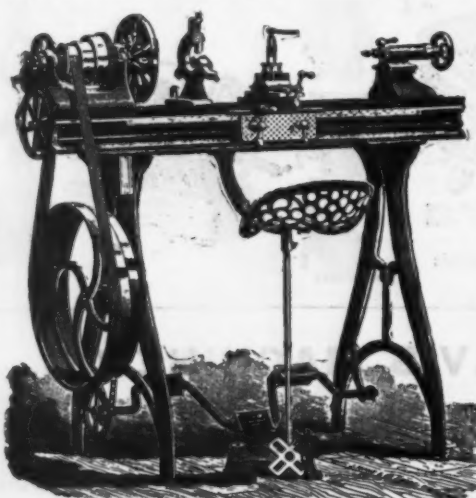
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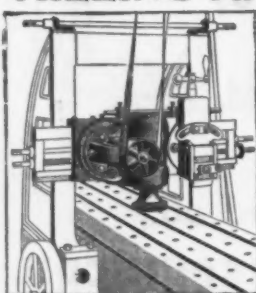
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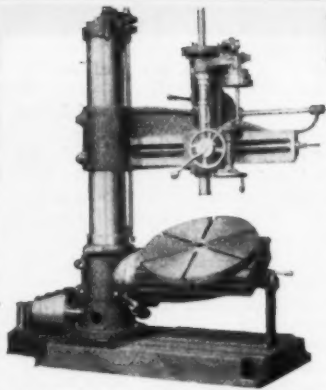


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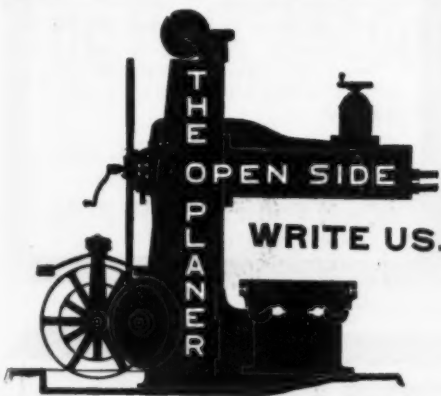
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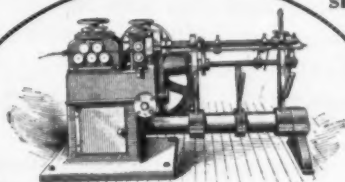
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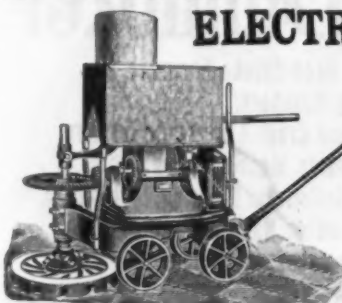
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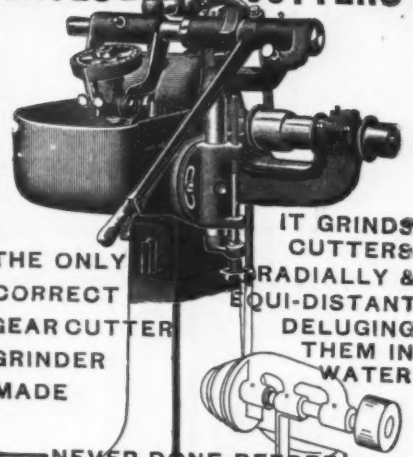
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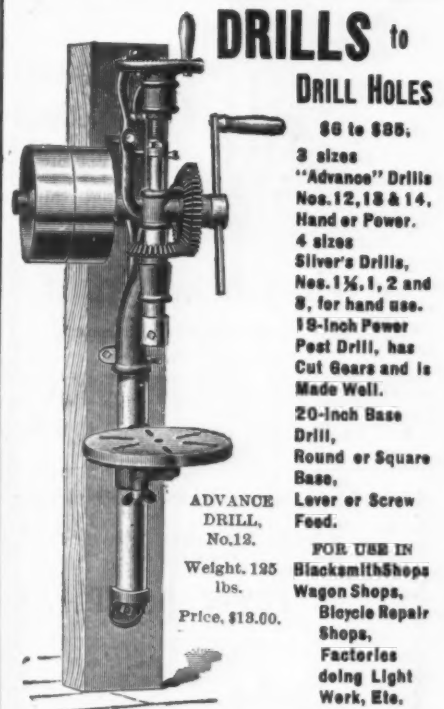


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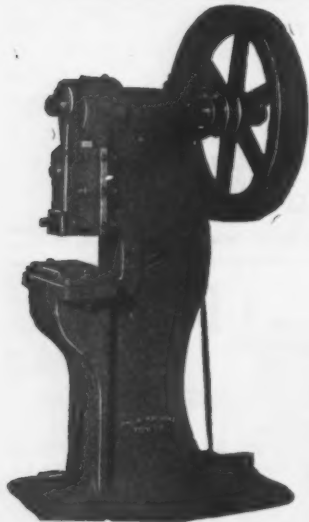


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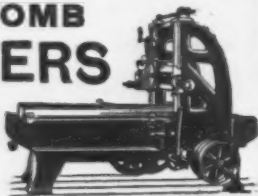
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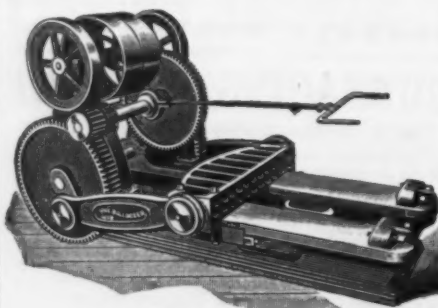
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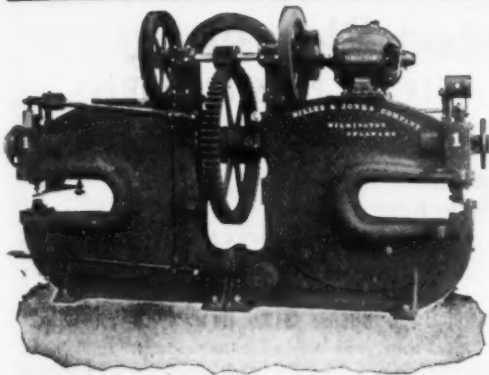


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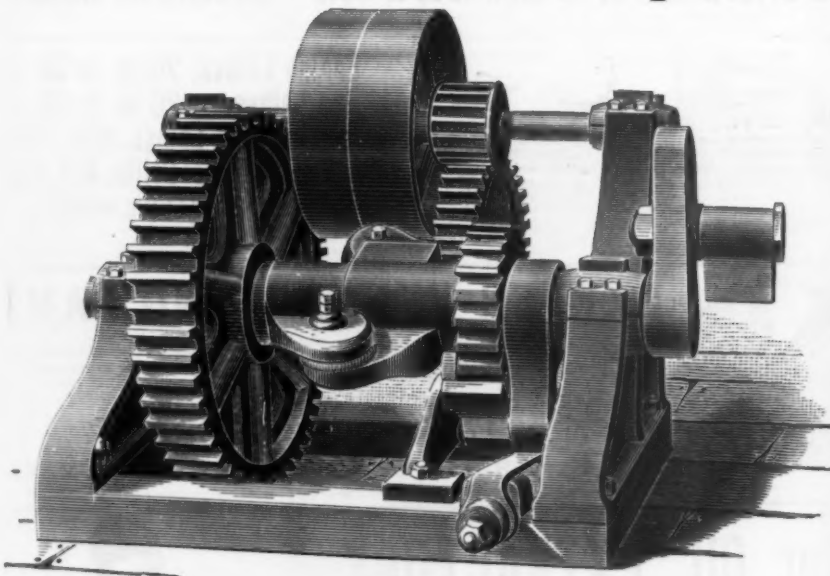




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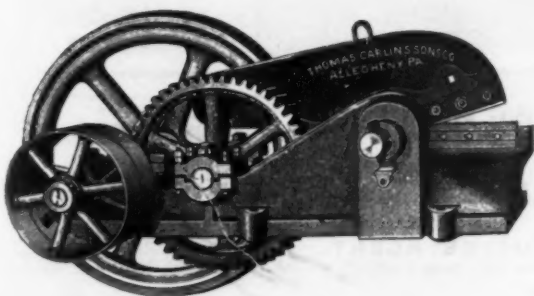
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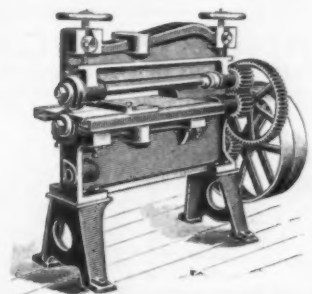
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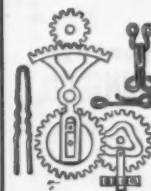


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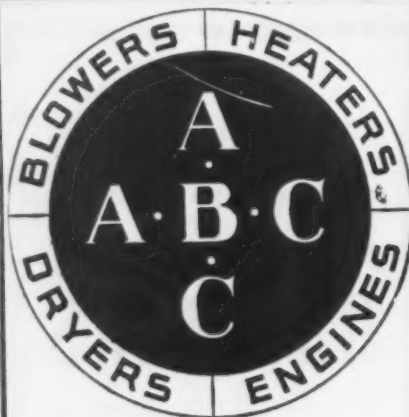
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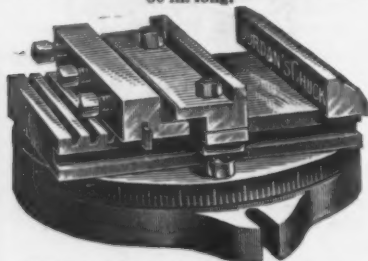
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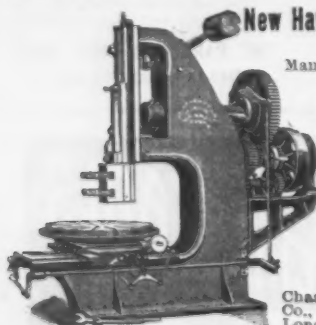
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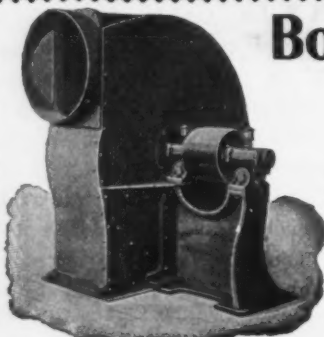
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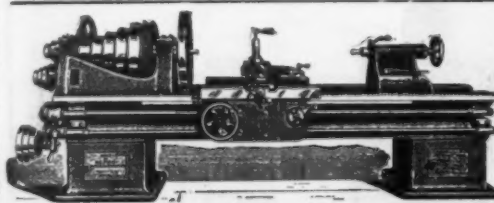
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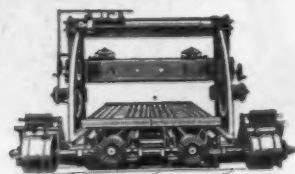
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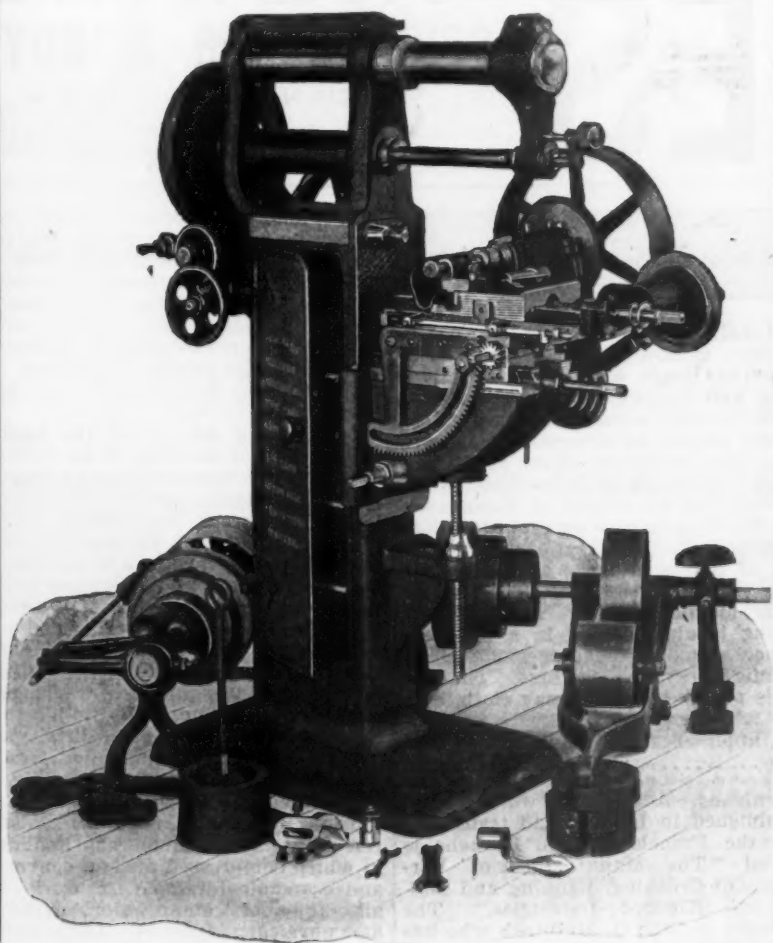
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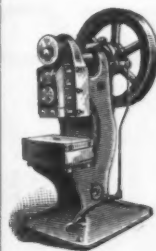
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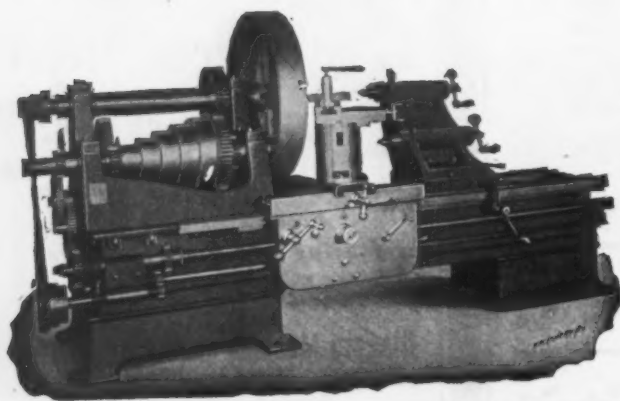
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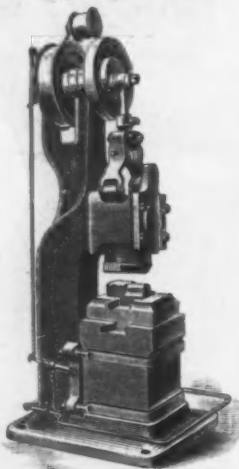
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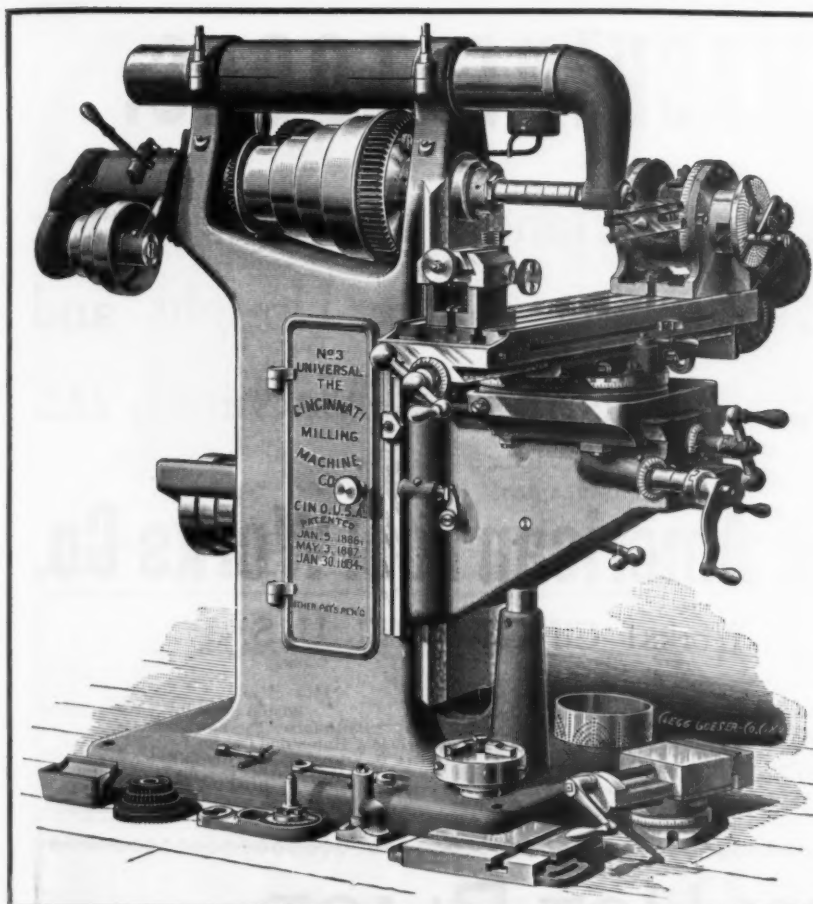
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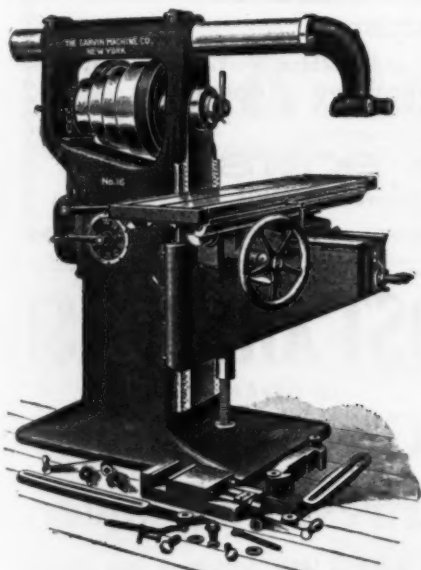
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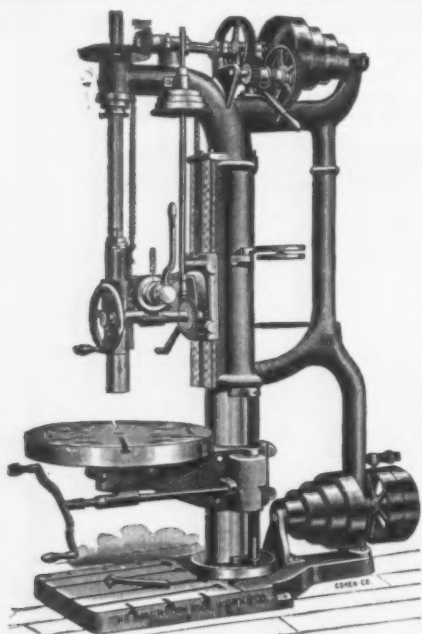
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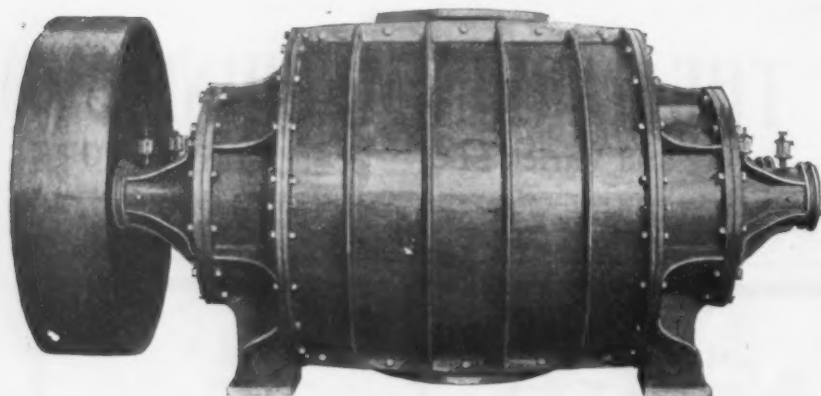
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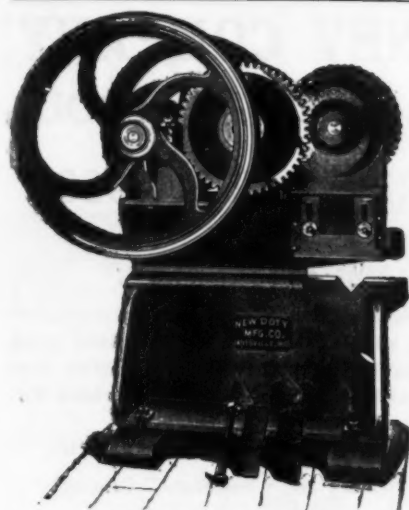
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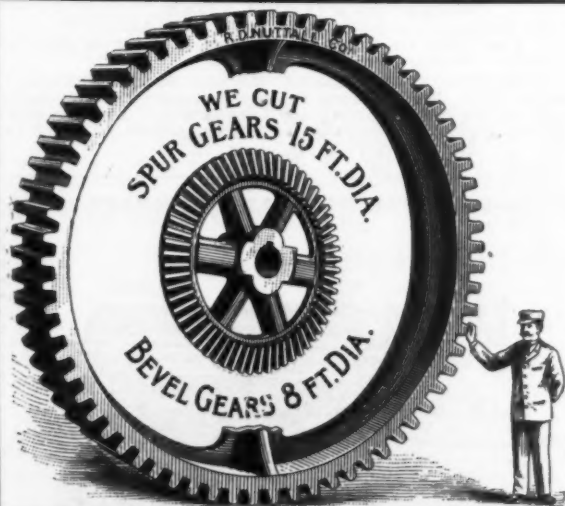
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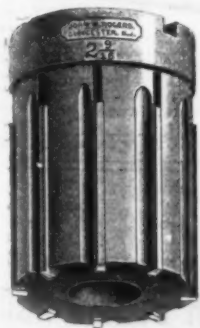
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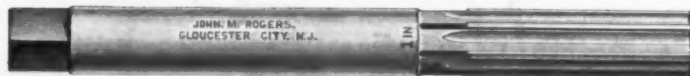
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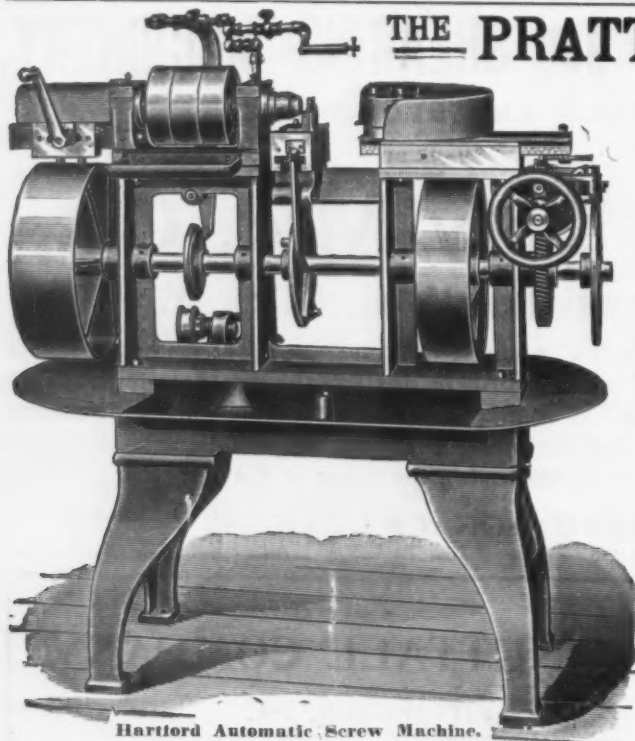
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FOREIGN REPRESENTATIVES: London, England, Buck & Hickman, 280 Whitechapel Road; Paris, France, Fenwick Freres & Co., 21 Rue Martel; V. Lowener, Copenhagen Denmark, and Aktiebolaget V. Lowener, Stockholm, Sweden; Dusseldorf, Germany, and Vienna, Austria, de Fries & Co.

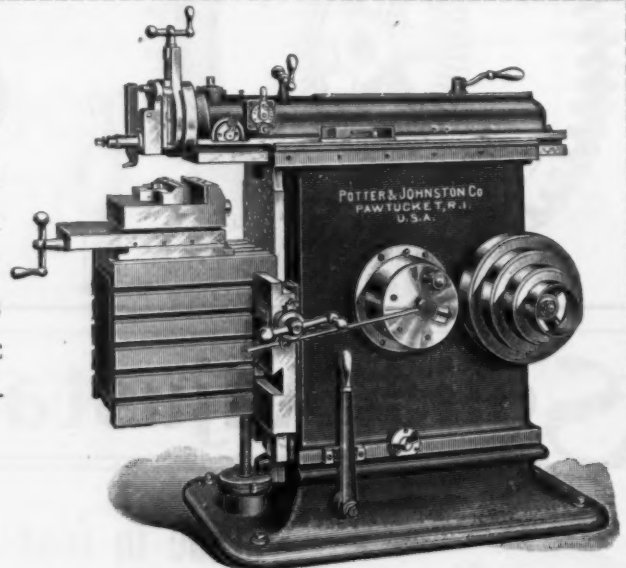
## 24-inch SHAPER.

This 24-in. Shaper has power down feed on any angle. Automatic stop to down feed. Table raised and lowered by power.

Send for complete description of this machine. Write for particulars of DOUBLE TURRET MANUFACTURING LATHE AND SIMPLEX AUTOMATIC.

## Potter & Johnston Company, PAWTUCKET, R. I., U. S. A.

New York Office, 126 Liberty St., - Walter H. Foster, Manager.



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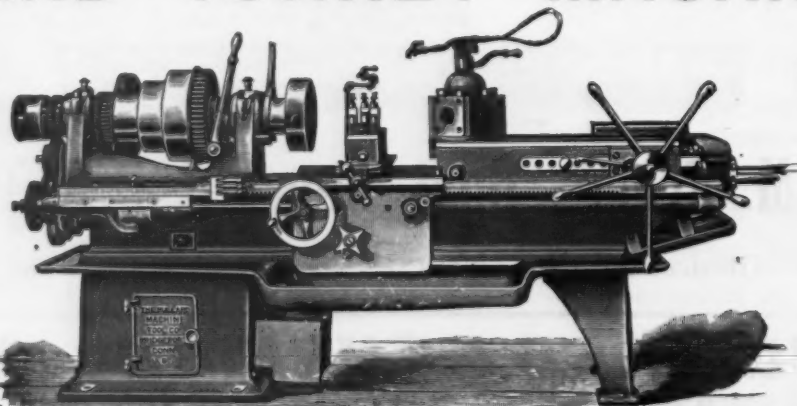
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FRICITION CLUTCH  
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STOPS. FINE FEED  
ATTACHMENT.

Ready for prompt  
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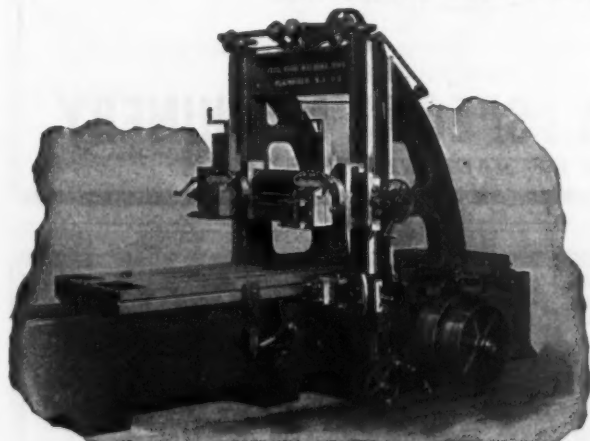
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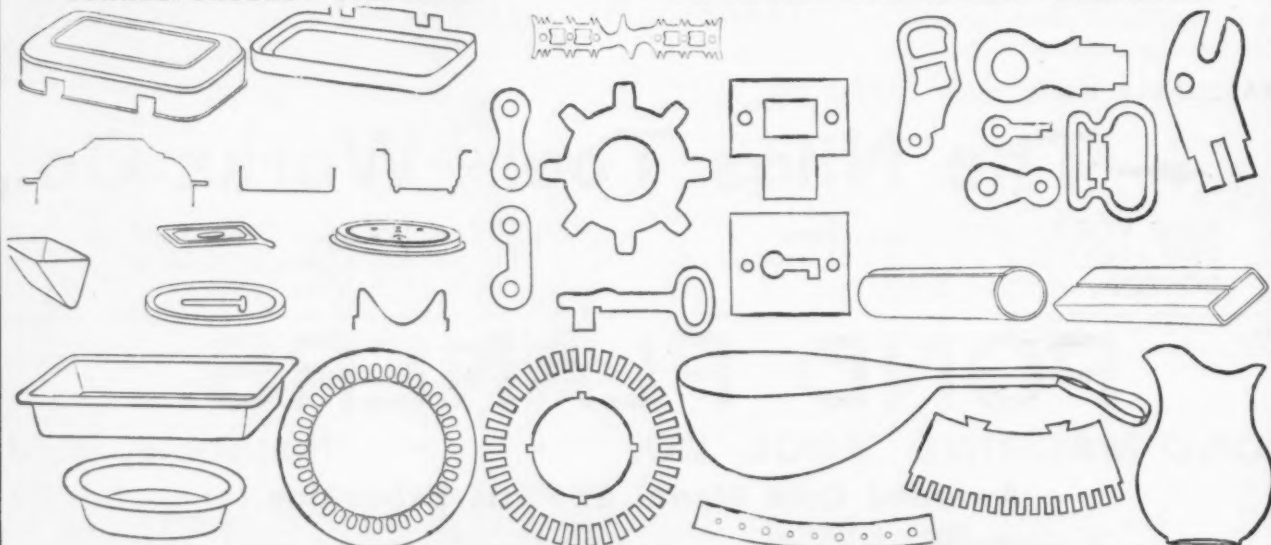
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WE CARRY A VERY LARGE NUMBER OF MACHINES IN STOCK.

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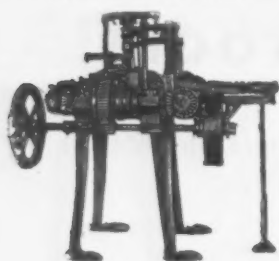
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Special Power Presses, Wire Forming Machinery,  
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LET US KNOW YOUR NEEDS.

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This difficult piece was  
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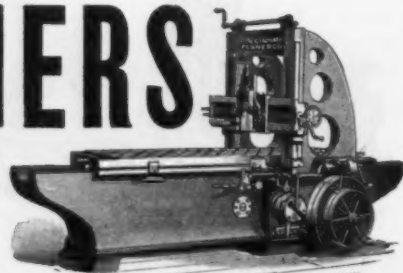
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have a Patent Dirt Proof Table which prevents chips from falling into the Vs, cutting them up. They have a safety Locking Device which avoids accident and spoiling of work. They have Micrometer Adjustment to the down feed, and a Patent Combination Friction that will not stick or burn out. Made in ten sizes, 24 in. to 50 in. square.

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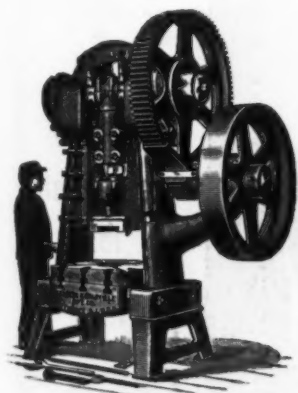


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Mills.

# MILLS

WITH OR WITHOUT ROLLER BEARINGS.

Brass,  
Tin and  
Copper,  
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Tin Foil  
Mills.



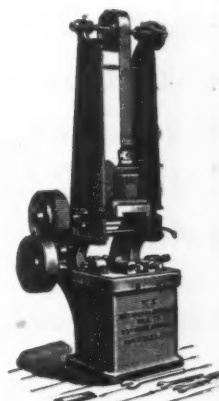
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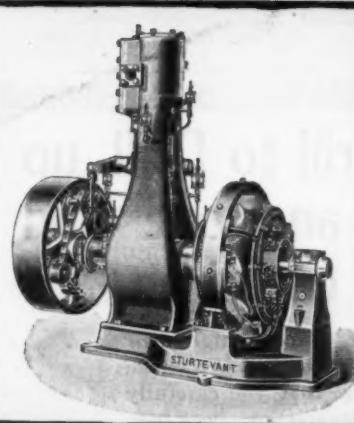
Power and  
Plain Drop.  
Automatic  
Drop Presses.  
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# PRESSES

Wire Drawing  
Machinery.  
Automatic  
Draw Benches.  
Coilers.  
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Machines.

## STURTEVANT GENERATING SETS

*In 100 types and sizes.  
High speed, and high grade.  
We build both engine & generator.*



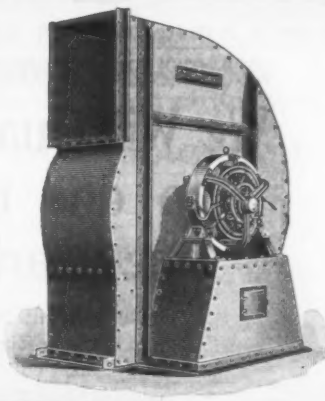
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Exhausters  
Steam Fans  
Electric Fans  
Engines  
Electric Motors  
Forges  
Exhaust Heads  
Steam Traps  
Heating  
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Mechanical Draft

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Special designs for requirements.  
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Drying Apparatus  
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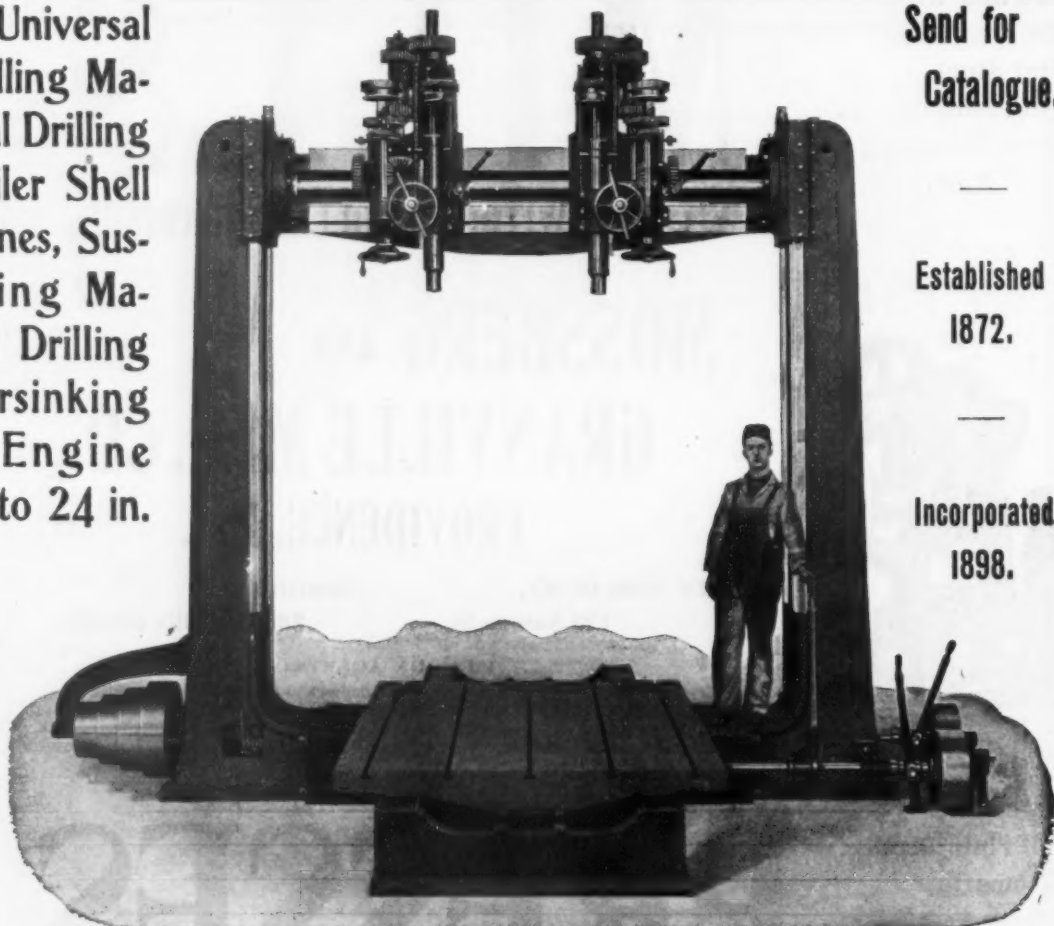
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**Radial Drilling Ma-**  
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**Lathes, 12 in. to 24 in.**  
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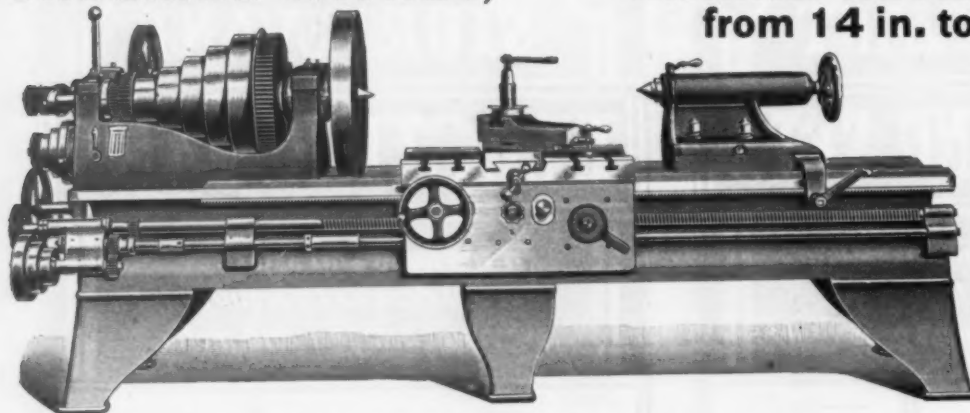
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**WORCESTER, MASS., U. S. A.**

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**72 in. BORING MILL,**  
**ENGINE LATHES**  
**from 14 in. to 42 in. inclusive.**



**24 in. x 12 ft. DRAPER LATHE.**

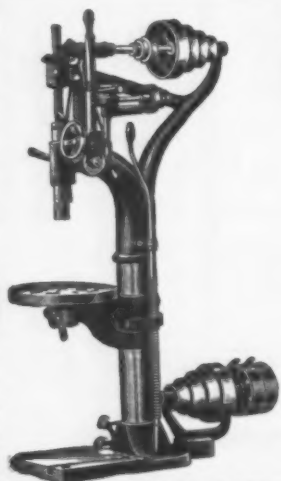
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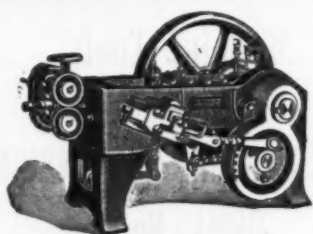
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**to one inch in Steel and one and**  
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without strain in any way. It is a B. F. Barnes 20-inch upright drill and is the best upright drill of its size made anywhere. We make larger sizes equally as good and earnestly advise that you carefully compare this drill with others—any others—before you buy. Book free.

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## A "Trade Secret" Out.

There is money for you in small

# STEEL AND BRASS SCREWS

(with rolled threads)

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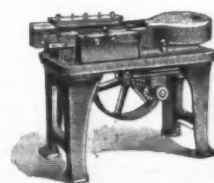
## Automatic Machines

will do the entire work at a cost for labor which would surprise you. Then, again, you can have your SCREWS just as you want them, and—more important still—just *WHEN* you want them.



SCREW SLOTSERS.

Why don't you make your own and Save Money.

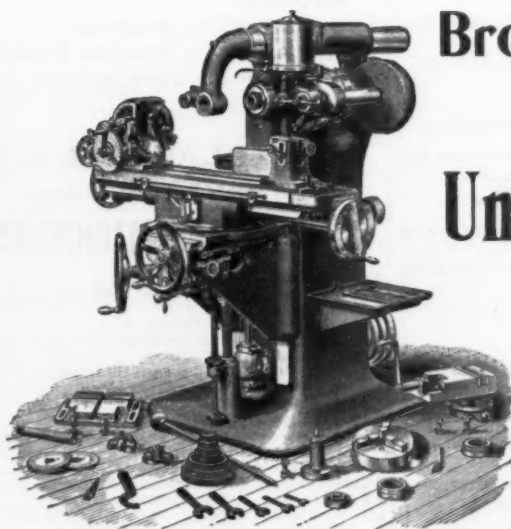


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THIS LINE IS BUILT ONLY BY

## THE E. J. MANVILLE MACHINE CO.,

WATERBURY, CONN., U. S. A.



## Brown & Sharpe Mfg. Co.,

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## Universal Milling Machine

We have manufactured Universal Milling Machines since 1863; in fact, the Original Universal Milling Machine was built by J. R. Brown in 1862.

We have, therefore, had ample opportunity to study the requirements of such machines; and, as shown by those we now build, produce machines that are accurate, trustworthy, and up-to-date.

### SOME FEATURES OF OUR MACHINES.

**ACCURACY:** All alignments correct. Feed Screws and Gears accurately cut. Rigid inspection of each part as well as of the completed machine.

**RIGIDITY:** All bearings and wearing surfaces amply proportioned to withstand the most severe service. Metal intelligently distributed to resist vibration.

**CONVENIENCE:** All levers and hand wheels located to insure ease of manipulation. Adjustments easily and quickly made. Spiral Head of improved design, has means for rapid indexing that can be used with head at any angle, and without removing any of the parts.

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## 2nd HAND MACHINERY, GOOD ORDER. LOW PRICES.

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24 in. x 8 1/2 ft. Pond, double head.  
72 in. x 14 ft. Hewes & Phillips, three heads.  
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36 in. x 12 ft. Atlas, double head.  
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50 in. x 20 ft. Triple geared Screw feed, spindle 10 in. dia. wt. 30,000 lbs.  
48 in. x 15 ft. raised from 34 in. Putnam  
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18 in. x 8 and 10 ft., latest pattern.  
16, 14, 13 and 12 in., best stand. makes.

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24 in. Geared, Friction, Hendey.  
16 in. Crank motion, Latest pattern.  
14 in., 26 in. feed, Trav. Hd., Fitchburg.  
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40 in. Swing, Single Head, Standard.  
40 in. Swing, extended to 72 in., Light.  
60 in. Swing, Double Head, Sellers, heavy pattern, with full auto. feeds.

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Gear Cutter, Auto, 50 in., Gould & Eber.  
Turret Checking Lathe, 36 in. swing. Universal Miller, No. 1, Brown & Sharps.  
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Hyd. Riveter, 36 in. reach, Bement.

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### Gray Planers.

24 in. x 6 ft.  
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36 in. x 12 ft., Two Heads.

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36 in. x 16 ft.  
31 in. x 14 ft.  
25 in. x 12 ft.  
21 in. x 12 ft.  
18 in. x 8 ft.

### "Kemp Smith" Millers.

Universal, all sizes.  
Plain Automatic, all sizes.

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## FOR SALE. IMMEDIATE DELIVERY.

One 18 in.-34 in. x 42 in. Fitchburg Tandem Compound Automatic Engine.  
One 18 1/2 in.-34 in. x 42 in. Cross Compound Fitchburg Automatic.  
One 28 in. x 48 in. Corliss Engine.  
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One 18 in.-30 in. x 16 in. Westinghouse Compound.  
One 22 in. x 42 in. Putnam Engine.  
One 20 in. x 4 in. Greene Engine.  
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Several 30 to 200 H. P. high speed Automatic Engines.  
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Two 540 Lt., 30 K. W. "H" Thomson-Houston, ea., \$300  
Extra armature for either above ..... 100  
Latest type Gen. Elec. "B" 1 1/2 K. W., 125v. .... 55

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All above overhauled and guaranteed. Subject to prior sale. Terms cash.

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Engine Lathes, 10 in. to 32 in. swing.  
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Milling Machines, Hand and Power.  
Screw Machines and Monitor Lathes up to 20 in.

Feed and Power Presses, a variety of sizes.  
Drop Hammers with and without automatic lifts.

Hurlbut & Rogers Cutting-off Machines.

Send for catalogue of Presses.

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One 12 in. x 28 in. Watts-Campbell Corliss Engine.

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Richards open side Planer and Shaper, planes 8 ft. long, 25 in. wide, 24 in. high.

30 x 30 x 10 Wm. Sellers Spiral Geared Planer.

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1 1/4 in. National Bolt Cutter.

25 lb. Justice Hammer.

No. 1 Slate's Milling Machine.

**S. M. YORK CO., Cleveland, O.**

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30 in. x 10 ft. Putnam Lathe.

28 in. x 12 ft. Fay & Scott Lathe.

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No. 2 Screw Machine, 15-16 in. wire feed capacity.

22 in. Snyder Drill, complete.

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Cincinnati Universal Reamer and Cutter Grinder.

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3 good Combination, standard gauge cars; seating capacity, 32.

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One Blake Stone Crusher, 15 x 9, with screen.

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Also other machinery.

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## Hilles & Jones Plate Straightening Rolls No. 2.

Has six rolls 10 in. diameter and will take 68 in. between housings, weight 23,400 lbs.

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## HARRINGTON SUSPENSION DRILL No. 1.

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IN FIRST-CLASS SHAPE.

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1 Perkins No. 2 Foot Lever Press.

1 Hendey 15 in. Friction Shaper.

1 Cleason Suspension Drill.

1 Eddy 24 in. Chucking Machine with power feed.

1 Hurlbut-Rogers 2 in. Cutting-off Machine.

1 15-ton Bradley Hammer.

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1 62 in. x 60 in. x 22 ft. Planer.

1 54 in. x 54 in. x 30 ft. 4 Head Planer.

1 32 in. x 32 in. x 12 ft. 2 "

1 30 in. x 30 in. x 8 ft. Planer, A1.

1 30 in. x 16 ft. New Haven Lathe.

1 12 in. Crank Shaper, Cheap.

1 14 in. x 42 in. Morgan Steam Hammer.

1 5 ton Miles Steam Hammer.

1 Plate Planer, planes 16 ft. long.

2 600 lbs. Merrill Drop.

1 Combined Punch and shear, cuts and punches 1/2 in.

1 Sand blast outfit, complete.

1 150 lb. Merrell Air Cushioned Hammer.

1 6 ft. 6 in. Gap, 50 ton Hydraulic Riveter.

1 14 in. x 14 in. x 15 A1 Clayton Duplex Air Compressor.

2 Pratt & Whitney Wire Feed Screw Machines.

**NEW YORK MACHINERY DEPOT,**

Office, 178 Broadway, N. Y.

## FOR SALE.

2 300 H. P. National Water Tube Boilers which are practically new. Complete with all fittings and Shaking Grates.

2 180 H. P. Babcock & Wilcox Water Tube Boilers, with all fittings.

32 in. x 60 in. Watts-Campbell Corliss Engine with Condenser and National Heater.

1000 Light Direct Connected Engine and Dynamo.

12 in. x 12 in. x 18 in. Ingersoll Compressor.

All low for prompt trade.

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12 Broadway, N. Y. City.



## Second-hand Machinery

### ENGINE LATHES.

2 in. x 5 ft. Le Blond Tool Room.  
12 in. x 4 ft. Pond, R. & F.  
12 in. x 5 ft. Young, plain.  
12 in. x 6 ft. Blaisdell, R. & F.  
14 in. x 5 ft. Putnam, R. & F.  
14 in. x 6 ft. Porter, R. & F.  
16 in. x 6 ft. Ames Maunfg. Co.  
18 in. x 6 ft. Fuller, R. & F.  
21 in. x 8 ft. Fuller, R. & F.  
23 in. x 10 ft. White, taper, "old style."  
23 in. x 12 ft. W. L. & Co., bk. ed. plain turning.  
36 in. x 12 ft. back geared turning.  
40 in. x 16 ft. geared plain turning.  
1 No. 2 Am. Tool & Mach. Co. Lathe.  
11 in. x 5 ft. Davis, R. & F.  
14 in. x 6 ft. Davis plain.  
14 in. x 6 ft. Pratt & W. R., & F. and Taper.  
16 in. x 8 ft. Pratt & W. R., & F. and Taper.

### SPEED LATHES.

212 in. x 5 ft. B. G. Speed.  
11 in. x 4 ft. "  
122 in. x 9 ft. "

### PLANERS.

124 in. x 24 in. x 4 ft. W. & L.  
126 in. x 26 in. x 6 ft. Pond.  
126 in. x 26 in. x 8 ft. Pond.

### PRESSSES.

1 No. 3 C. & M. single.  
1 No. 14 Stiles, heavy.  
1 No. 5 Blake & Johnson arch.  
1 No. 3 Heavy Screw Press.  
1 No. 30 Bliss special incline.

Large stock new machines. Prices on application.

Two 20-ton Hand Traveling Cranes, 58 ft. 10 in. span.

Send us lists of machines you have for sale, or exchange.

**THE NILES TOOL WORKS CO.,**  
136-138 LIBERTY STREET, NEW YORK CITY.

## Material at Pittsburg, Penna.

126 in. x 42 in. L. H. Corliss, 50-ton fly wheel, 14 in. shaft.  
124 in. x 42 in. L. H. Corliss, 16 ft. band wheel, 42 in. face.  
128 in. x 48 in. R. H. Freeman balanced valve engine, 30 ton fly wheel, 30 ft. dia., 17 in. shaft.  
120 in. x 36 in. heavy box bed slide valve engine, 12 in. shaft, 15 ton fly wheel.

### Electric Light Plants.

1 10 in. x 12 in. Erie Ball Automatic engine, driving two Edison incandescent dynamos, 125 volts, 20 K. W., rated at 350 16 C. P. lights each, with two amperes and 2 volt meters, in first-class condition.  
1 10 in. x 12 in. Russell automatic engine, driving one 30 K. W. General Electric dynamo, 125 volts, capacity, 500 lights.  
This engine and plant have only been used one year, and are as good as new.  
1 dynamo, 110 volts, 50 amperes, 50 16 C. P. incandescent lights, in good order.  
1 15 light arc machine.

## Material at Saginaw, Michigan.

1 pair 28 in. x 60 in. Harris Corliss Engines.  
1 20 in. x 35 in. x 36 in. Tandem Compound Corliss Engine.  
1 20 in. x 42 in. Harris Corliss Engine.  
1 22 in. x 42 in. Wright four-valve auto. Engine.  
1 12 in. x 12 in. Phoenix automatic Engine.  
1 Silsby Fire Engine.  
1 16 ft. Hilles & Jones Plate Planer.  
1 20 in. Morton Keyseater.  
1 24 ft. x 75 in. Band Wheel, 18 in. bore.

### WICKES BROTHERS,

45th St. & A. V. R. Y., Pittsburg, Pa.  
Tel., 243 Fisk.

### IMMEDIATE DELIVERY.

12 Plain Vertical Engines, 3 to 50 H. P.  
Plain Horizontal Engines, 10 to 150 H. P.  
Automatic Engines, 3 to 300 H. P.  
Direct Connected Engines, 3 to 300 H. P.  
Simplicity, strength and highest efficiency.  
Hoisting Engines, 4 to 100 H. P., single and double cylinders and drums.  
Full line Machine Tools and Wood Working Machinery.  
Write us for Catalogue No. 100.

PENNSYLVANIA MACHINE CO.,

The Bourse, Philadelphia, Pa.

## Leather Belting.

2500 lbs. desirable second-hand Leather Belting for sale in one lot. In sizes from 2 in. to 24 in. single and double, and in brass working shop about 1500 lbs. in 6 in. and under.

Full particulars of

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## I Have No Use

For the following:

A 48 in. x 8 ft. Pond Horizontal Cylinder Boring Mill.—A No. 1 order.

A 48 in. Heavy Drill Press.—Back geared, hand feed.

A 25 in. x 12 ft. 8 in. Sellers Lathe.—Triple geared, all feeds, good order.

A 16 in. x 24 in. Bement Crank Planer.—Good as new.

A 34 in. x 16 ft. New Haven Lathe.—Medium weight, screw feed.

A Sellers Axle Lathe.—One head.

A Lot Cheap Lathes.—Assorted sizes. Good for lots of work.

A Combined Punch and Shear.—Makes  $\frac{1}{8}$  in. holes in  $\frac{1}{2}$  in. plate.

2 No. 9 Sturtevant Blowers—With countershafts.

Send for New List.

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## FOR SALE.

50,000 Fire Brick, good as new.  
500 feet 12 inch Cast Iron Bell Pipe.  
300 New Sugar House Wagons.  
Several large Iron Tanks, both round and square.

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## 2d HAND FEED WATER HEATERS.

Largest stock in America. Will be sold at bargains. These heaters are mostly taken in exchange for our improved Berryman (Kelley's Patent), "A Little Giant," vastly superior to all other feed water heaters, both as to results and durability.

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## FOR SALE.

2 Rotary Shears, 40 inch.  
5000 ft.  $\frac{1}{4}$  in. Cable.  
Electric Pressure Blower.  
Steam Pump, 30 x 14 x 30.  
150 light Loomis Dynamo.  
Materials of all kinds purchased.

WALSH'S SONS & CO.,

Newark, N. J.

## FOR SALE.

No. 6 Root Blower.  
2 in. Cleveland Auto. Screw Machine.  
25 in. Horizontal Cylinder Boring Machine.  
21 in. x 27 in. x 3 ft. Fitchburg Planer.  
36 in. x 36 in. x 14 ft. L. W. Pond Planer.  
76 in. Bliss Geared Straight Side Press, 15,000 lbs.  
No. 51 Ferracute Punch Press.  
19-16 and 1 1/2 in. Screw Machines.

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## 2d-Hand Machinery Bargains.

One 16 in. x 36 in. Harris and 22 in. x 42 in. Wright Corliss Engines. High Speed Automatic, Simple, Compound, Condensing and Slide Valve Engines, also Blowing Engines, Air Compressors, Boilers, Heaters, Pumps, Vacuum Fans, Ice Machines, Electric Motors, Generators, Railway Supplies, Metal Working and General Machinery.

CHAS. BEHLEN,

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One 18 x 42 Wheelock Corliss Engine, complete, \$1,000.  
One 20 x 42 Wright Automatic Engine, complete, \$1,200.  
Eight 60 x 16 Horizontal Steel Tubular Boilers, complete, a bargain.  
12 x 56 Lane & Bodley refitted Corliss Engine at \$750.  
Three 11 x 18 celebrated Straight Line Automatic Engines, complete, at a bargain.

Send for Late Stock List.

NORTON & COLE MACHINERY CO.,  
Cincinnati, O., 6th & Carr Sts.

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## BOILERS.

One 150 H. P. Heine Water Tube with full set fixtures and trimmings. Hartford allows 125 lbs. pressure.

One 66 x 16 Tubular Boiler, 64 4 in. tubes, brand new breeching and stack 32 in. x 60 ft. Allowed 100 lbs. pressure.

Four 60 x 16 Tubular Boilers, 44 4 in. tubes; 100 pounds pressure.

Two 44 x 16 Boilers, thirty 4 in. flues, new fronts, all fixtures and trimmings. Allowed 100 pounds pressure.

One 1200 H.-P. Berryman Feed Water Heater. Used two months. Built 1898.

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One right hand Wetherill Corliss Engine, cylinder 28 x 60; flywheel 20 feet diameter, weight 30 tons; shaft 15 in. x 12 ft. 6 in.; rope drive pulley 18 ft. diameter and grooved for 15 2-inch ropes; driven wheel 78 in. diameter grooved for 13 2-inch ropes; two iron idlers with boxes complete. With or without Independent Condenser 10x14x16.

20 in. x 24 in. Erie City "Class B" Automatic Cut-off Engine, balanced valve, left hand; Tangye bed, very heavy, weight complete, 35,000 lbs., 250 horse-power. Used four months.

One 10 x 20 Box Bed Slide Valve, wheel 72 in. x 12 in. complete.

W. W. WHITEHEAD,

DAVENPORT, IOWA.

## CORLISS ENGINES FOR SALE.

1 34 x 60 Right Hand Horizontal Engine with 24 ft. diameter, 30 ton fly wheel.  
1 34 x 60 Left Hand Horizontal Engine with 25 ft. diameter, 40 ton fly wheel.

W. J. CARLIN COMPANY,  
610 and 611 Lewis Bldg., Pittsburg, Pa.  
NEW YORK OFFICE:  
514-515 Park Row Bldg., New York, N. Y.

## BARGAINS—SECOND-HAND TOOLS.

Planer 34 in. x 34 in. x 15 ft. table. Fairbanks.  
Double Lathe, 32 in. swing, 20 ft. bed. Gage & Campbell.  
Single Lathe, 15 in., 16 in., 17 in. and 18 in. swing, 6 ft. to 8 ft. bed.  
Blower, No. 5 1/2. Baker.  
One H. S. H. Engine, 10 1/2 x 12 in. Armington & Sims.

A. V. KAISER & CO.,

223 So. 3d St., Philadelphia.

## BARGAINS

13 in. x 9 ft. Eng. Lathe, Stover.  
14 in. x 6 ft. " Fitch. M. W.  
20 in. x 10 ft. " " Fildell.  
20 in. x 4 ft. Whitcomb Crank Planer and Chuck.  
20 in. B. G. Drill, Stover.  
20 in. B. G. & S. F. Drill, Stover.  
24 in. " Drill, New Haven.  
28 in. " " Blaisdell.  
4 ft. Radial. Cin. Radial Drill Co.  
1 Mossberg Power Press.  
No. 3 Stiles Geared Press.  
No. 1 Un. Grinder. Brown & Sharpe  
16 IN. Crank Shaper. Ohio M. T. Co.  
1 Lapping Machine. Diamond.  
Gang Drills, Speed Lathes, Grinders, Sensitive Drills, &c.

If you wish to buy or sell please let me know. Can give bargains in new and second-hand machines at all times.

CEO. E. AFFLECK,  
109 Liberty St., N. Y.

## WANTED.

Engine Lathe for cutting  $2\frac{1}{4}$  in. and  $2\frac{1}{2}$  in. steel screws, to take 12 feet between centers and fitted with two tool posts, so thread cutting can be done in both directions.

LINCOLN IRON WORKS, Rutland, Vt.





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Are offered by J. H. Hillman & Son, Empire Building, Pittsburg, Pa., in the following first-class properties:

### BLAST FURNACES IN PENNSYLVANIA.

No. 1, capacity 300 tons daily, now running, making over \$5 per ton profit. Can be turned over promptly. Will pay half the cost this year.  
No. 2, capacity 200 tons daily, now running with big profit.

### LAKE SUPERIOR (Mesaba) IRON ORE Lands.

Ready for operation August 1st.

### TWO HUNDRED COKE OVENS AND Five Thousand Acres of Coal Lands in West Virginia.

### FIFTY COKE OVENS AND COAL Lands on the Main Line of Pennsylvania Railroad.

### CONNELLSVILLE COAL LANDS and Coke Ovens.

### EIGHTY COKE OVENS AND CONNELLSVILLE coal in Connelville region.

### FIFTY THOUSAND ACRES OF COALING coal adjoining Connelville region. Nine foot vein in Fayette and Greene Counties, Pa. These lands offer the best investments now before the American public.

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Capacity 25,000 tons per annum. Now shipping East and West. Modern electric equipment. Coal is like Pocahontas smokeless used in the United States Navy. Being exported.

### FIFTY THOUSAND ACRES OF KENTUCKY Coal and Timber Land.

### WELL-KNOWN IRON PROPERTY IN Kentucky

With well-developed ore mines and millions of tons of ore in sight and has also a large number of farms on the Cumberland and Tennessee Rivers. This property contains 40,000 acres and is a principality in itself.

### MANUFACTURING PROPERTY IN the Monongahela Valley.

### THICK VEIN COAL IN THE Monongahela Valley.

In the 3d, 4th, 5th, 6th and 7th pools of the Monongahela River.

### SOMERSET COUNTY COAL LANDS.

In tracts of five, ten, twelve and seventeen thousand acres each, are cheap and are being sold rapidly to Eastern capitalists.

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### MANUFACTURING PROPERTIES and sites in Pittsburg and Allegheny Cities, Pa.

### FIFTEEN THOUSAND ACRES OF coal in Centre and Clinton Counties, Pa., on the Beech Creek Railroad, suitable for shipment East.

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### A FIRST-CLASS CHARCOAL BLAST Furnace.

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Empire Building,

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ROOTS', second hand, bought, sold or exchanged.

All my blowers are overhauled by expert blower machinists.

I do not advertise a "fake" list of blowers not in my possession; my stock is constantly changing.

Write for particulars and prices.

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Ground Floor, 109 Liberty St., New York City.

### ENGINES, STATIONARY and MARINE.

2 Eaton and Prince Passenger and Freight Elevators.

2 Upright Marine Engines; also one 14 x 18, and one 12 x 20 Horizontal Engine.

Machinery bought, sold and erected.

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## Second-Hand Machinery.

### LATHES.

60 in. Henley Pulley Lathe.  
36 in. Streit Pulley Lathe.  
30 in. x 14 ft. Fitchburg, compound rest.  
28 in. x 16 ft. Putnam, compound rest.  
24 in. x 12 ft. Putnam, compound rest.  
24 in. x 10 ft. New Haven.  
18 in. x 8 ft. Fitchburg, compound rest.  
16 in. x 8 ft. Blaisdell, rise and fall rest.  
10 in. x 4 ft. Bench Lathe, screw cutting, with compound rest and spring chucks.

### PLANERS.

33 in. x 33 in. x 10 ft. Cincinnati, two heads, practically new.  
36 in. x 12 ft. Hewes & Phillips.

### PUNCHES AND SHEARS.

Heavy Geared Punch, Tod Co.  
Long & Allstatter "C" Punch, very heavy.  
Toledo Geared Press, power feed rolls.  
Ferracute Tube Drawing Press.

### SHAPERS.

12 in. Steptoe Crank.  
24 in. Hendey Friction, power feed in head.  
26 in. Smith & Mills.

### MISCELLANEOUS.

10 ft. Alfred Box Radial Drill.  
25 in. stroke Giant Key Seater.

Send for complete list of Second-hand Machinery.

**MARSHALL & HUSCHART MACHINERY CO.,**

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510 Johnson Building, Cincinnati, O.

## FOR SALE.

A large quantity of Ivory Button Machinery, Laundry Machinery and Printing Presses, one large size Ames Gear Cutter, Turret and Fox Lathes, Die Sinking Machine, Profiling Machine, Engine Lathes, Planers and Steam Engines and Boilers.

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Springfield, Mass.

## FOR SALE.

Two No. 2 Brown & Sharpe Plain Grinding Machines. For prices and particulars apply to

**THE THOMAS & LOWE MCHY. CO.,**

MACHINERY, TOOLS AND SUPPLIES,

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## BARCAINS.

One 16 in. x 24 in. Penna. Iron Works Engine, practically new.

One 16 in. x 22 in. Hor. Cut-off Engine.

One 7 in. x 10 in. Double Cylinder Double Drum Hoisting Engine and Boiler.

One 7 in. x 10 in. Single Cylinder Single Drum Hoisting Engine and Boiler.

Corliss, Automatic and Plain Slide Valve Engines.

Hor. and Vertical Boilers, all descriptions.

LOVEGROVE & CO.,

149-145 N. Third St., Phila., Pa.

## BARCAINS.

8 x 15 Upright Hoisting Engines, - \$300

1 24 in. Frank Pony Planer, - 35

1 Hale Hydraulic Pass. Elevator, - 400

1 " " Freight " - 200

**WARNER ELEVATOR MFG. CO.,**

Cincinnati, O.

## Have For Sale.

New Corliss Engines, Simple, Compound and Condensing, sizes ranging from the smallest up to a 1000 H P. Now ready for delivery, one 18 x 42 right hand and one right hand and left hand 14 x 36. Don't fail to write me before placing order, as prices cannot be duplicated.

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## FOR SALE

Two 14-in. Schutte Condensers with automatic free exhaust valves and strainers. We have used these, each connected to a single cylinder blowing engine, 43 in. steam and 84 in. air cylinder, 5 ft. stroke, with very good results. Machines are as good as new and are displaced by a central condensing plant and can be seen at our plant at Brier Hill, Ohio. Will be sold cheap for immediate delivery.

**YOUNGSTOWN STEEL CO.,**

Youngstown, O.

## SECOND-HAND MACHINERY

88 in. Triple Geared Lathe. Old style, will sell cheap.

42 in. x 8 ft. Ingersoll Slab Miller.

36 in. x 30 in. x 12 ft. New Haven Planer.

42 in. x 42 in. x 12 ft. Niles Tool Works Planer.

No. 4 Hercules Bulldozer.

No. P. 5 Ferracute Power Press.

No. P. 3 Ferracute Power Press. B.G.

50 in. G. & E. Anto. Gear Cutter.

36 in. G. & E. Anto. Gear Cutter.

## McDOWELL, STOCKER & CO.,

59 and 61 So. Canal St., Chicago, Ill.

### READ CAREFULLY. For Sale-Bargains.

40 H. "Otto" Gas Engine.....	\$400
20 H. "Otto" Gas Engine.....	300
10 H. Sterling Charter Gas Engine.....	200
14 x 20 Slide Valve Engine.....	200
25 H. "Russell" Horizontal Steam Engine.....	100
6 H. Upright "Kriebel" Engine.....	00
50 H. Horizontal Tubular Boiler.....	225
26 H. Portable Engine and Boiler.....	150
6 H. Upright Engine and Boiler, NEW.....	110
60 in. "Huyett & Smith" Ventilating Fan.....	12
No. 1 "Sturtevant" Blower.....	15
12 in. Upright Drill Press.....	120
900 H. "Austin" E. Heater.....	75
100 H. "Murphy" Pressure Heater.....	30
30 H. "Kroeschell" E. Heater.....	350
34 x 10 "Putnam" Engine Lathe.....	100
Complete Belt Power Elevator.....	25
68 in. x 20 in. Steel Rim Double Arm Pulley.....	25
30 in. x 20 in. Steel Rim Friction Clutch Pulley.....	20
28 in. x 10 in. Steel Rim Friction Clutch Pulley.....	20
15 H. Firebox Horizontal Boiler.....	100
20 H. Firebox Horizontal Boiler.....	100
20 H. Center Crank Engine.....	90
All guaranteed.	

PARADOX MACHINERY CO., 181 E. Division St., Chicago.

## PARTIAL LIST OF SECOND-HAND MACHINERY IN STOCK.

1 150 H. P. Buckeye Automatic Engine.	
1 125 " " " " " "	
1 80 " Baker " " " "	
1 80 " Atlas " " " "	
1 80 " Payne " " " "	
1 20 " " " " " "	
1 20 " " " " " "	
2 120 " 66 in. x 18 ft. Tubular Boilers.	
1 80 " 60 in. x 16 ft. " " "	
1 75 " 54 in. x 18 ft. " " "	
1 60 " 54 in. x 14 ft. " " "	
1 12 x 13 x 10 Worthington Duplex Pump.	
1 12 x 7 x 12 Smith-Valle Duplex Pump.	
1 14 x 10 x 14 Knowles Pattern Single Pump.	
2 No. 6 Morris Machine Works Centrifugal Pumps, and a large number of smaller engines, boilers, pumps, etc.	

**RAINIER & WILLIAMS,**

63 So. Canal Street, Chicago, Ill.

## BOILERS.

2 375 H. P. Sterling Water Tubes for 150 lbs.	
2 200 H. P. National " " " "	125
3 72 in. x 16 ft. Return Tubulars " " "	130

## ENGINES.

2 40 in. x 72 in. International Power Co. Corliss Engines. Shafts 20 in. dia., 8 ft. between center of bearings. Wheels 24 ft. dia., 50 ton. 1 Right hand, 1 Left hand.

1 24 in. & 38 in. x 60 in. Tandem, Allis, Tangye frame.

1 26 in. x 48 in. Allis Corliss, Right hand, condensing. Wheel 18 ft. dia., 32 in. face.

1 18 in. x 42 in. Allis Corliss Condensing, wheel 18 ft. diam., 22 in. face.

1 16 in. x 42 in. Allis Corliss.

1 11 in. and 19 in. x 24 in. Tandem Compd., Buckeye.

1 16 1/2 in. x 25 in. x 15 in., Cross Compd. Armington & Sims.

1 18 in. & 30 in. x 16 in. Westinghouse comp'd.

3 16 in. & 27 in. x 16 in. Westinghouse comp'd.

1 13 in. x 13 in. N. Y. Safety Automatic.

2 13 in. x 14 in. Watertown " "

1 14 in. x 13 in. Armington & Sims " "

1 15 1/2 in. x 16 in. N. Y. Safety " "

2 16 in. x 16 in. Ball " "

2 16 in. x 16 in. Cooper " "

5 18 1/2 in. x 18 in. Ideal " "

1 18 1/2 in. x 18 in. McIntosh " "

## CONDENSERS.

1 600 H. P. Snow Condenser.	
1 1000 H. P. Nordberg Condenser.	
3 325 H. P. Davidson Condensers.	

## Rossiter, MacGovern & Co.,

Electrical and Steam Machinery.

141 BROADWAY, N. Y. Factory, Brooklyn.

SEND FOR CATALOG.

## Engine Bargains.

26 x 72 Providence Corliss.  
30 x 72 Hamilton Corliss.  
30 x 72 Harris Condensing Corliss.  
24 x 48 Hamilton Corliss.  
30 x 42 Hamilton Corliss.  
18 x 42 Harris Corliss.  
16 x 42 Fraser & Chalmers Corliss.  
15 x 24 Watertown Automatic.  
14 x 30 "ummer 4 valve Automatic.  
13 x 26 Buckeye Automatic.  
12 x 22 x 18 Payne Tandem Compound Automatic.  
12 x 24 Cooper Slide Valve.  
12 x 24 Mansfield Slide Valve.  
12 x 18 Slide Valve.  
10 x 12 Slide Valve.

The above are all in first-class condition and ready for shipment.

A. L. DAWSON & CO.,  
27-31 W. Washington Street, Chicago, Ill.

## For Quick Delivery.

### SINGLE VERTICAL PUNCHES.

42 in. throat, 1 1/2 in. through 1 1/2 inch plate.  
30 in. throat, 3/4 in. in 1/2 inch.  
24 in. throat, 3/4 in. in 1/2 inch.

### SPLITTING SHEARS.

For 3/4 in. and 1/2 in. plate.

### DOUBLE ANGLE SHEAR for 4 x 4 x 1/2 in. angles.

Plate-edge Beveling Shear, for 3/4 in. plate.  
Gate Shear and Multiple Punch, 78 in.

### BENDING ROLLS, 100 in., for 1 1/2 in. plate.

Hand Spacing Table, 8 ft.  
Boiler Makers' Flanging Clamps, 10 ft.  
Steam Riveter, 6 1/2 ft. gap.  
Plate Planer, 6 ft. cut.  
Duplex Vertical Engines, 9 x 9.

HILLES & JONES COMPANY,  
Wilmington, Delaware.

## BOILERS—ENGINE.

2 60 in. by 22 ft. Boilers; have 18 6 in. flues and Hawley Down Draft Furnaces.

1 30 in. by 48 in. Hamilton Corliss Engine, with 18 ft. Band Wheel, 24 in. face.

For Sale by

W. C. Johnson & Sons Mach'y Co.,  
513-515 N. Second St., St. Louis, Mo.

## One Thousand Machine Tools

Just placed in our hands,  
**FOR SALE.**

If you can use tools of the following descriptions we can make you low prices, prompt delivery and give you a large lot to choose from.

Milling Machines, all sizes, best makes.  
Lathes. Large number small lathes.  
Drills, all kinds.  
Power Presses, Bliss 7 1/2 and 7 1/2 and smaller.  
Planers and Shapers, plenty.  
Polishing Lathes, all kinds, all sizes.  
Emery Grinders.  
Screw Machines, every make and every size.

SALE NOW ON.

Write for full particulars.

Geo. H. Bowler, Williamson Bldg.,  
CLEVELAND, O.

## Plate Planer.

We offer for immediate delivery,

1 16 ft. PLATE PLANER,  
made by William Sellers &  
Company, which is in first-  
class condition.

Delivery in Central Penn-  
sylvania.

WILLIAM A. READE & CO.,

216-217 American Trust Bldg., Cleveland, Ohio.

## Harrisburg, Pa. An Ideal Shipping Point

Have you ever experienced the need of a central distributing point for the eastern field? Many manufacturers now carry stocks of goods here. The best located man often gets the trade. You can RENT Large, Centrally Located Warehouses with attendants, of us, or you can BUY our former plant (we now occupy our new factory), well located for manufacturing or warehouse purposes. HARRISBURG FOUNDRY AND MACHINE WORKS

## Second-hand Tools

### For Immediate Delivery.

1 800 lb. Merrill Drop Hammer.  
1 14 in. x 60 in. Pratt & Whitney Shaping Machine.  
1 12 in. x 60 in. Bement Shaping Machine.  
1 10 Pratt & Whitney Tool Room Lathe.  
1 No. 3 Stiles Punching Press.  
1 No. 3 Fowler Press.  
1 54 in. x 19 ft. Planer, double head.  
1 60 in. Heavy Radial Drill, 5 inch spindle.  
1 Small Horizontal Boring and Drilling Machine, Bement.  
1 12 H. P. Otto Gas Engine.  
1 No. 1 1/2 Pratt & Whitney Hand Milling Machine.  
1 No. 2 1/2 Newton Duplex Milling Mach.  
1 No. 5 Cleveland Auto. Screw Machine.  
1 Lodge & Davis Screw Machine, 2 in.  
1 No. 2 Jones & Lamson Screw Machine.  
1 36 in. Hydraulic Wheel Presses.  
1 16 in. Slotting Machine.

## U. Baird Machinery Co.

123-125 Water St., 124-126 First Ave.,  
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We have lately purchased the site of the Pacific Rolling Mills in San Francisco and are now equipping same with a modern shipbuilding plant. In consequence, we have on hand and for sale, at a low price, the following:

One 8 inch, one 10 and one 12 inch Guide Mill, each complete with housings, guides, boxes, carriages, brasses, clamp bars, tongs, etc., etc., with full sets of roughing and finishing rolls.  
One 18 in. Bar and one Rail Mill.  
One 28 in. Beam Rolling Mill.  
Also with full sets of Rolls for each mill.

One Charging Machine.

Also one Roll Turning Lathe, double header, for turning two rolls at same time. Bed 42 feet long by 5 ft. 6 in. inside way. Swing 3 ft. 9 in.  
Four Tool Rests.

Four Roll Neck Rests.

Two Clutches for driving work.

In first-class shape with necessary tools for same.

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We have also quite a number of boilers and engines that have been used throughout the rolling mill, which we will sell at a low figure. Write and send for circulars.

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## Where to Locate.

Manufacturers using iron, steel or wood will find the best locations for successful plants along the

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These locations lead in cheap raw material, cheap, contented and desirable labor, cheap fuel and in good facilities for marketing products. Opportunities now open for establishing new plants are fine and should be investigated. Other investments will prove profitable in the South.

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We also have 350 tanks of different sizes.

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SECOND-HAND, FIRST-CLASS ORDER  
800 lb. Pratt & Whitney board lift automatic Drop Hammer.

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16 1/2 in. Screw Machine with Chard turret, Davis & Egan M. T. Co.

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No. 3 Garvin Hand Milling Machine.

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No. 1 Davis Key-Seater.

14 in. x 8 ft. Perkins Engine Lathe, plain rest.  
14 in. x 6 ft. Lodge & Davis Engine Lathe with compound rest, 30 in. x 22 ft. New Haven Mfg. Co. Lathe with compound rest.

Write us for any machinery wanted, or if you wish to exchange or sell.

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18 in. x 48 in. Allis-Corliss Engine.  
150 H. P. Cross-com. Armstrong & Sims Auto. Eng.  
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One pair of 14 x 24 mine HOISTING ENGINES.

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Belting, shafting and Pulleys.

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4 32 in. x 20 ft. " 14 6 in. " "

1 28 in. and 1 25 in. Drill Press (new). No. 9 Startevant Cupola Blowers.

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Good second-hand Gas Pipe; about 4,000 ft. 5 1/2 in. and between 4,000 and 5,000 ft. of 5 in.

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 \*1 23 in. x 4 in. Geo. H. Corliss make.  
 \*1 24 in. x 36 in. Mackintosh, Hemphill & Co.  
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For Balance and for Belts.

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Very fine steel self-supporting stack, 64 in. diam., 100 ft. high, with base casting, ornamental top and ladder.

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 1 in. hole through 1 in. iron; 23 in. throat.

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**LOCOMOTIVES, New and Second hand.**

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- 24 in. x 8 ft. Perkins Engine Lathe, plain rest.  
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 18 in. x 15 in. stroke Blaisdell Planer.  
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 No. 96 Stiles & Parker Press.  
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 6 in. x 8 in. Willett's Breaking Down Rolls.  
 8 in. Davis Cutting Off Machine.  
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 No. 1 Roper's Oil Separator.  
 12 in. x 12 in. 25 H. P. A. & S. Engine, new.  
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 And many other second-hand tools. Also a large com-  
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Foundry site with excellent water power at Medi-  
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Fine foundry buildings at Allentown, Pa., with  
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Entire plant for manufacturing  
**WOVEN WIRE FENCING,**  
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Corliss Engine 28 in. to 30 in.  
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 Address "ENGINE," care The Iron  
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 1 12 in. Shaper, heavy machine, Michaels.  
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 1 20 in. heavy Drill, Gould & Co.  
 1 13 in. Sensitive Drill and Chuck, W. & R.  
 1 36 in. heavy Bk. Gd. Drill, Massinet Mfg. Co.  
 2 No. 2 Garvin Screw Machines.  
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 1 13 in. x 6 ft. bed, No. 6 Barnes Engine Lathe.  
 1 22 in. x 16 ft. Engine Lathe.  
 1 24 in. x 12 ft. " " New Haven Mach. Co.  
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**For Sale. A lot of about 2000 new  
 Twist Drills, straight and taper shank.  
 Size from ¼ in. to 2 in. diameter gradu-  
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- 1 7 x 10 "C. C." Engine.  
 1 8 x 12 " " "  
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 1 6 x 6 Vertical Engine.  
 1 48 x 9 Vertical Tubular Boiler.  
 1 35 H. P. Portable Boiler.  
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Tools lately in use in Boiler Manuf'g Plant.

- 1 40-ton 36 in. Gap Hydraulic Portable Riveter.  
 1 set 20 ft. Niles Rolls.  
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- 42 in. by 20 ft. Lathe.  
 32 in. by 20 ft. Lathe.  
 20 in. by 10 ft., also 20 in. by 12 ft. Lathes.  
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 48 in. by 60 in. 24 ft. Planer, 3 heads.  
 30 in. by 25 in. 5 ft. Planer, 1 head.  
 36 in. by 47 in. 13 ft. Planer, 1 head.  
 28 in. Drill, B. G., P. F., sliding head.  
 32 in. Drill, B. G., P. F., sliding head.  
 6 in. Shaper.  
 16 in. by 24 in. Milling Machine.  
 700 pound Steam Hammer.  
 No. 9 Long & Allatt's Shear, 20 in. Throat, 20 in. Shear.  
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- Root Blowers Nos. ¼, ½, 1, 2, 3, 4, 5 and 6.  
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 All thoroughly overhauled and guaranteed in good  
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Write for particulars and get my special prices.  
 All makes of Blowers bought, sold and exchanged.  
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A1 stock of hardware in the best town in Southern  
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We are the largest dealers on  
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 No. A 419 1 8 x 10 automatic Atlas.  
 No. A 433 11 x 16 x 16 McEwen tandem compound.  
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 tal box bed, center crank, reversible  
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Our stock of boilers includes horizontal tubular,  
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We have in stock all kinds of steam pumps and  
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Ask for our complete stock list of lathes and  
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Over 200 different items on hand in the above.  
 State your wants.

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We have in stock and can make to order any  
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Combination Ice and Roller Skate Dies.  
Patent for Elevator Stop and Lock.  
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A complete Wire Nail Plant, consisting of German Spring Machines with the American Improvements, etc.

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All sizes and makes, from 1/4 to 35 horse power, new and slightly used. Some modern makes sold for much less than first cost, older types rebuilt at our own works and sold fully guaranteed very cheap. State your wants.  
Machinery of all descriptions bought, sold and exchanged.

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1 DA Iron Split Pulley, 18 ft. x 41 in. x 10 in. bore.  
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6 Housings for 9 to 12 in. rolls.  
1 Triple Continuous Housing, for 9 in. rolls.  
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Henry Martin Brick M'ch'e and Pug Mill, cap. 25,000 daily at \$300.  
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2 16 x 16 x 16 Alland Air Compressors.  
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## A GOLDEN OPPORTUNITY.

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## Complete Sugar Refinery.

Known as St. Cloud Sugar Mill.

Capacity, 600 Tons per day.

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### WANTED.

One second-hand Rolling Mill Engine, about 350 H. P.

Address "MILL ENGINE,"

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One second-hand set of 18 in. or 20 in. three high scrap rolls with housings and pinions and housings for same. Address "SCRAP ROLLS,"  
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Will invoice about \$6,000. Stock in perfect condition. New goods and bought at the right prices. With fine growing trade in Southwest Georgia town. Heart of the timber belt. Will bear closest investigation. Only reason for selling party wishes to go into other business. This is a rare chance for some one to step into a good business. Almost exclusive cash trade and a good profit. Address

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One 24 in. Blade Lewis Foundry and Machine Co. Billet Shear. Will cut 6 in. square cold.

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Will be sold in lots to suit.

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680 Old Colony Building, Chicago, Ill.**Book Notes****Blue Print Making.**—The making of blue prints, a matter of interest to architects, builders, manufacturers, and others who find it economical or expedient to prepare blue print paper on their premises, is treated in a pamphlet called "Blue Print Making." This consists of matter reprinted from *Carpentry and Building*, and gives simple directions and formula. Price....**25 cents.****Steel.**—The numerous seekers after information pertaining to Steel, its properties and manipulation, will find in Metcalf's "Manual for Steel Users" a simple and satisfactory treatment, with answers to questions continually arising. The book describes Steel, its uses, applications and the processes of manufacture, with chapters on hardening, tempering, annealing, &c. Price...**\$2.00****Joint Wiping.**—A sixth enlarged edition of "Practical Hints on Joint Wiping for Beginners in Plumbing" is now ready. The book, which is a reprint from *The Metal Worker*, gives illustrated descriptions of the manner of wiping joints, an operation involving skilled workmanship. The new matter consists of a number of practical letters and articles on different phases of the subject. Price.....**25 cents.****Lobben's "Machinists' and Draftsmen's Hand-Book,"** recently published, is a practical hand-book for young engineers and machinists who are ambitious to fit themselves for more advanced work. It contains information with tables, rules and formulæ such as are required for reference in all mechanical and engineering work, and will be found to be an excellent manual for the student and for the young working mechanic. 432 pages, 12mo, illustrated. Price .....**\$2.50****Gas Engine Construction.**—A practical work on the building of gas engines is just published, entitled "Gas Engine Construction," by Henry V. Parsell and Arthur J. Weed. A one-half horse-power engine is taken as a basis for treatment, the work of construction being described and illustrated progressively and in detail. Working drawings of the various details are given. The volume contains 300 pages, cloth bound, price..**\$2.50****Travelers and Business Men** generally will read with interest and profit "The Knight of the Grip," which attractive book is a reprint of the serial article of this title which appeared in *The Iron Age*. The hardware traveler is the hero of these sketches, mostly taken from life; they are both serious and amusing and relate to his position in the trade; the companionableness of the traveler; his temptations, his methods and manners, &c. The volume contains 179 pages, is bound in cloth, and sold at.....**60 cents.**

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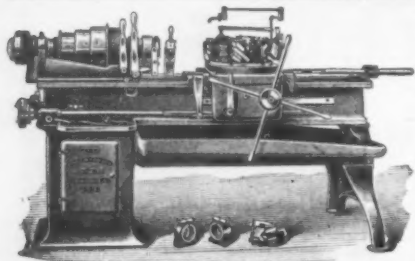
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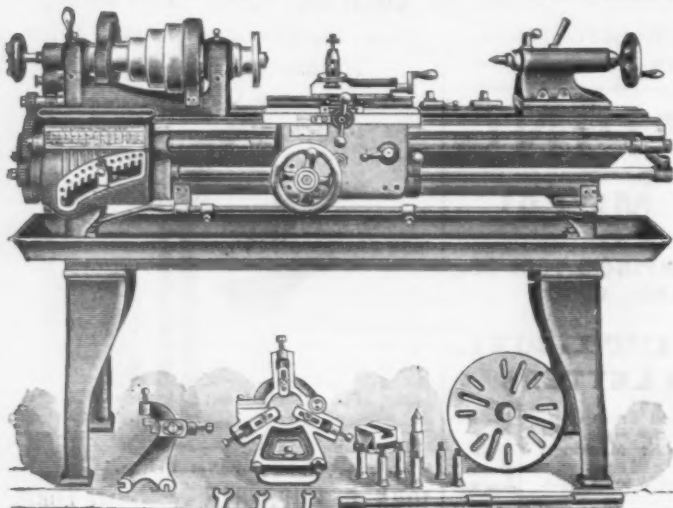
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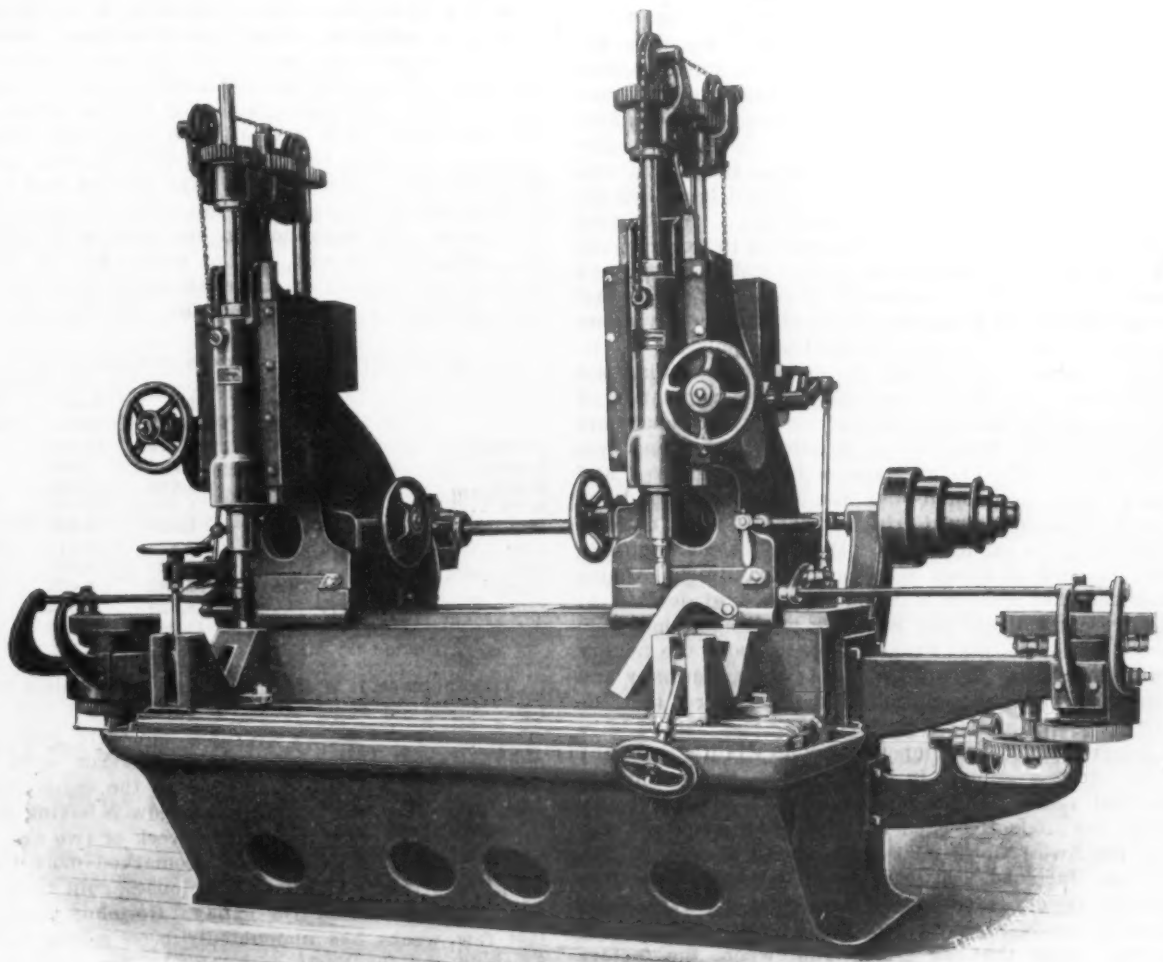
THURSDAY, DECEMBER 13, 1900

## **The Philadelphia Duplex Vertical Milling Machine.**

The duplex vertical milling machine designed and built by the Philadelphia Machine Tool Company of 445 North Darian street, Philadelphia, is intended for cutting keyways in shafts, axles, &c. The keyway is cut with an end mill which leaves it finished with half-round ends so that the key can be at once dropped in place. For much axle work two keyways are required and by using two heads the work is greatly hastened. In other axles a single keyway is required, but as it is

the square lock type. The spindle itself runs in a bronze taper bearing. It has a total vertical movement of 12 inches. The spindle and slide are balanced. The heads can be set to cut a keyway at any place between their extreme positions. The machine will take shafts up to 18 inches in diameter and weighs about 8000 pounds.

**The Portland Iron & Steel Company.**—The Portland Iron & Steel Company, Portland, Maine, William S. McGowan, treasurer and general manager, successors to the Portland Rolling Mill, whose former plant was destroyed by fire, have entirely rebuilt, and are running a day and



THE PHILADELPHIA DUPLEX VERTICAL MILLING MACHINE.

near the end of the axle two axles can be set on the machine at once. Where the work is such that two heads cannot be operated to advantage the machine is provided with a single head.

The heads are driven independently and the spindle is fed downward automatically with a variable feed. The heads are driven with a reciprocating motion, the stroke varying from nothing to 10 inches. At each end of the stroke the spindle feeds downward. A hand cross feed is provided for dressing out the side of the keyway when desired. A special feature of this machine is the method of supporting the spindle close down to the work to secure rigidity and accuracy. For this purpose it is self contained in the slide and the slide is of

night shift, employing about 200 men. The equipment of the plant consists of a puddle mill with four furnaces, an 18-inch bar mill with two furnaces and a 10-inch guide mill with two furnaces. Another furnace will be ready for operation about December 10, which will bring their output up to about 75 tons per day. The mill is located in South Portland close to the Boston & Maine Railroad, from which side tracks extend into the yards. A wharf on Fore River connects with the plant, being approachable by vessels of considerable size at high water. The company maintain their own electric light plant for lighting the mill and offices. At present they are making bar, angle and bolt iron and rolled iron shafting.

## "America's Economic Supremacy."

LONDON, ENGLAND, November 24, 1900.—It is no exaggeration to say that English manufacturers, particularly in the iron and steel trades, are watching America with keen interest, not untinged with anxiety. A good many of us have been reading a book entitled "America's Economic Supremacy," by Brooks Adams (The Macmillan Company), and one of the leading financial journals has reviewed it almost favorably and, to some extent, has given it the sanction of its indorsement. As the author of this book sets himself to prove rather more England's decadence than America's economic supremacy, it is difficult not to regard this incident as distinctly significant. And further, as it would appear from Brooks Adams' book that America is winning mainly upon her predominance in the iron and steel trades, it is not surprising that more than one English ironmaster has read the book with more than mere academic interest.

### The Most Recent Facts.

Brooks Adams labors under the disadvantage of having written the bulk of his book at a time of bad trade, when English exports were shrinking. He does not seem to have realized, in dealing with his statistics, that during the past three years British exports, so far from shrinking, have increased even to the extent of taxing our productive capacity almost to its utmost limit. His argument as to England's decadence is further vitiated by two elementary facts, which I should have thought no serious writer would have overlooked. In the first place, he attaches too much importance to export trade in general as an indication of national vitality; and secondly, he fails to make due allowance for the fact that, whereas the population of Great Britain only grows in natural ratio, the increase in the population of the United States is abnormal, thereby inducing abnormal production. At the present moment the population of the United States is not far short of 50 per cent. more than the population of Great Britain. For various reasons the world's export trade is better organized and more easily formulated than the home trade, and the result is that superficial critics are apt to test a nation's vitality by its export trade without sufficient regard to the standard of living at home. Thus Brooks Adams assumes that France is being squeezed to death. At the present moment that is a very tall assumption. We know, of course, that France seeks to dodge the factory system, as it has shown itself in America, Germany and England; but, philosophically, who can affirm that the factory system may not in the coming years prove to be a much greater drain upon national vitality than any other existing element in human life? For example, I see that a metallurgist, writing in the *Ironmonger*, puts down the productive capacity of English labor at 1 and  $\frac{1}{4}$ , the Swiss German at  $1\frac{1}{4}$ , and the Yankee at  $2\frac{1}{4}$ . If these facts be true, may it not be argued that the factory system, carried to an extreme, as in England, actually tends to reduce vitality? And may we not further argue that, as in England, where the factory system is in its intensest development, labor vitality is reduced in inverse ratio; and so, in like manner, it may be argued that, as America and Germany are following the same lines of development, labor vitality in both those countries may in the long run diminish. But if countries like France and Russia, where the factory system and the large industry are obnoxious to the temperament of the people, eventually escape from this concentrated form of industry, they may retain their vitality when the Teuton and the Saxon have been "bled to the white"—to use Bismarck's phrase. I only quote this to indicate how dangerous this form of *a priori* reasoning is. But there is no use disguising the fact that the English iron and steel trades are seriously perturbed. I do not think they are so much afraid of America's skill or the value of American labor as with the quite palpable fact that America holds the whip hand, both of England and Germany, in resources of raw material. Shrinkage in English native iron ore is sufficiently startling. In 1884 the total output of native iron ore was 18,026,000 tons, or 88 per cent. of the total

consumption on the part of the smelters. At the present time the proportion has fallen to 40 per cent., while of the 60 per cent. which we now import we are rapidly getting down to second grades. In 1870 our total imports of iron ore were only 208,000 tons; in 1880 they had reached 4,471,000 tons; and in 1899 they had gone up to 7,054,000 tons. This is really the weak point in the British iron and steel industrial armor, while obviously it is quite the strongest point making for what Brooks Adams calls "America's Economic Supremacy."

### The Immediate Problem.

The real test will, however, soon be upon us. In times of great trade expansion—expansions which are generally contemporaneous, so far as nations are concerned—everybody is busy and, in consequence, it is difficult to arrive at any accurate conclusion as to what are the real elements of trade vitality. It is admitted now that reaction is taking place and that we seem to be once again on the downward curve. Already we are anxiously watching the figures of American iron production which appear in *The Iron Age*. And English makers are wondering if there is any likelihood of American production being limited in proportion to American trade contraction. Although some limitation of output is expected, yet it is recognized that the limitation will by no means bear relation to trade contraction, and that consequently a considerable surplus of American iron and steel production must find an outlet, here and elsewhere. It is interesting to know that, whereas last year we were buying from America very heavily in pig iron, this year the trend is all toward steel billets. Our imports of American pig iron, up to the end of October, show a big reduction on our imports of 1899—an indication, by the way, of the slackening of trade—whereas our imports of American steel billets this year have gone up by leaps and bounds. The figures are as follows:

British Imports of American Iron and Steel.

	Pig Iron.		Steel billets.	
	1899. Tons.	1900. Tons.	1899. Tons.	1900. Tons.
January .....	14,621	5,724	12,034	409
February .....	13,528	2,356	5,206	369
March .....	9,401	4,688	5,992	585
April .....	6,969	1,853	10,060	2,632
May .....	6,969	1,629	9,580	2,190
June .....	6,833	4,829	2,471	14,988
July .....	4,229	3,121	4,967	10,200
August .....	4,870	7,282	3,432	11,883
September .....	4,209	8,829	1,342	21,538
October .....	4,346	11,041	1,753	31,217
Totals .....	75,975	51,352	56,837	96,011

This increase, it is observable, has been mainly taking place since last June. It is further asserted that much of these imports are on contracts that were made three months ago, when, relatively, American steel was cheaper than the British article. At the same time we must remember that even now Glasgow is buying American steel very freely, one firm, a week or two ago, buying as much as 50,000 tons. I remarked more than a month ago that we were buying once again from Germany, and it remains true to-day. Germany during the last few weeks has undoubtedly been selling steel in Scotland and the North of England. The price of coal has a great deal to do with this. Some of the largest buyers of coal, as, for example, Joseph Livesey, are now convinced that the prices of coal must come down early in the new year. Joseph Livesey (who buys for two large gas companies) recommends that no immediate contracts be made with the collieries. He says that he is only buying from hand to mouth and will make no long contracts for some time to come. But that is by the way. The point I am considering for the moment is how far the balance of Anglo-American trade is in favor of America. Taking the full volume of trade done between the two countries, during the first three-quarters of this year, and comparing it with the two previous years, I find the following is the result:

British Trade with the United States.

Nine months—	Exports of British productions.	Imports.
1898.....	£10,957,740	£90,072,309
1899.....	12,816,074	89,432,713
1900.....	15,681,604	95,665,612
Increase, 1898-1900.....	4,723,864	5,593,303
Increase, 1899-1900.....	2,865,530	6,232,899



On these figures it is quite obvious how the matter stands, and it is, therefore, not surprising that English manufacturers are uneasy and anxious. Of the exported British goods to America, of the amount stated above, iron, steel, hardware and machinery stands for £2,200,000, or roughly, \$11,000,000. Brooks Adams would argue that because we were buying so largely from America (this year will probably see purchases from Great Britain to America to the extent of \$650,000,000, including cotton, of course), therefore Great Britain is a declining nation. The inference wants much more substantial proof than is offered to us. But, broadly, it may be asserted that signs are not wanting of a certain slackness in recent British methods. On the other hand, it may be said, without the slightest exaggeration, that there is still plenty of vitality in English traders, and when once they are aroused to the gravity of the situation they will not let the grass grow under their feet in making up lost ground. An example of this is to be seen in the action of the Technical Department of the University College of Sheffield, who have made a special grant of \$6000 for the purpose of acquiring imported machine tools. A careful selection has been made of the best European and American tools, the majority of the orders going to the United States. England is represented by a tool room lathe and a hexagon turret lathe. A Berlin firm has supplied a tool room lathe, universal milling machine, quick return shaper, and vertical drill. American firms are represented by tool room lathes, quick return planer, a Walker universal cutter grinder, and emery tool grinder. This indicates that British makers mean to tackle the problem seriously, and it will be interesting a few years hence, at the end of the coming trade depression, to discover if it has led to a substantial improvement in English methods of production. Meantime, the latest facts are that American firms are beating English firms both in quality and promptitude. The chairman of the Great Eastern Railway has been taxed with buying American plant for British railways. He replies: "I am sorry to say the report is true—viz., that we have placed a large order for steel rails and fish plates with the Carnegie Steel Company. Our reasons for taking such a course are the obligations we are under to maintain our road in a high state of efficiency, and thus to provide for the safety of the traveling public."

"We have had during the past two years two contracts running for rails and chairs with one of the leading rail companies in England, and the final deliveries of the first contract were 11 months in arrear, while of the second we have not yet received a single rail, and it shows a deficiency of 9000 tons, and this in spite of the most strenuous and continuous exertions on our part to insure punctuality in delivery. The consequence has been that our engineer has been seriously impeded in his work, and the necessary relaying of portions of our road has been unavoidably delayed. We had, therefore, no option but to go where we knew we could rely upon good material and prompt delivery, and that at a price below what we should have been compelled to pay in England."

But, notwithstanding all the facts which may be stated, both *pro* and *con*, I would not recommend American manufacturers to accept Brooks Adams' conclusion that England is in a state of decadence. In any case, however, we are all watching America at the present moment. What takes our breath away, after all, is the enormous resources in raw material which America possesses.

S. G. H.

**The New Yankee Drill Grinder.**—An interesting catalogue has just been issued by the Wilmarth & Morman Company, Grand Rapids, Mich., successors to the Fuller Mfg. Company, Kalamazoo, Mich. The company claim to be the largest makers of drill grinders in the world. The catalogue states that for the first time a line has been presented of drill grinding machinery adapted to every size or style of drills made, including three and four lipped drills, flat drills, rose and chucking reamers, &c. A very full description of the principles upon which the company's machines are constructed is given in the first four pages. Illustrations then follow of the new

Yankee drill grinder in a variety of styles suited to different classes of work. These styles range from A to L. On one page of the catalogue is a presentation of a group of drills showing the actual range of sizes ground on the company's machines. These sizes range from 5 inches in diameter to No. 60.

### Certified Checks for Navy Bids.

WASHINGTON, D. C., December 11, 1900.—Secretary Long has forwarded a communication to the Senate Committee on Naval Affairs urging an important modification in the present requirements of the laws concerning the filing of certified checks in lieu of bonds by manufacturers and dealers bidding on naval supplies. The modification desired by the Secretary is set forth as follows:

"Upon the Department's recommendation Congress, by act of May, 1896, 'authorized the Secretary of the Navy, in his discretion, to accept in lieu of the written guaranty required to accompany a proposal for naval supplies, and in lieu of the bond required for the faithful performance of the contract for furnishing such supplies, a certified check, payable to the order of the Secretary of the Navy, for the full amount of such proposal or contract.' This statute was enacted for the benefit of the larger dealers, who are frequently deterred from submitting bids for small lots of naval supplies by the inconvenience to which they were subjected by the previous requirements of law in the matter of filing written guaranties and formal bonds."

"The system of accepting certified checks in lieu of bonds has been found in practice to be an admirable one with respect to small items; but dealers are naturally reluctant to cover a proposal for a large amount by a certified check, which is equivalent to a deposit of cash, upon which interest is lost during the life of the contract. Inasmuch as bonds are not exacted for the full amount of contracts, there would seem to be no sufficient reason for requiring certified checks for greater sums than would be named in bonds if given for the same purpose."

"In the interest of bidders and of the Government alike it is recommended that suitable legislation be asked reducing the security required in the case of certified checks to such proportion of the contracts as may, in the discretion of the Department, be deemed sufficient and satisfactory. This would place guaranties given by certified check upon the same basis as guaranties given by bond, and would, it is believed, be of advantage to the Government by inducing in many cases proposals at lower rates than would otherwise be offered."

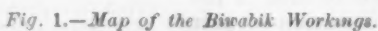
"Owing to the fact that proposals for supplies are invited in a great many cases every year, the business connected therewith is voluminous and the matter of convenience is one of much importance, and it is recommended, therefore, that the amendment proposed receive the favorable consideration of the committee."

W. L. C.

**A New Open Hearth Plant.**—The Crucible Steel Company of America, with offices in Empire Building, Pittsburgh, have in contemplation the building of a modern open hearth plant, which will probably be built at Elizabeth, Pa., where the Park Steel Company, a constituent interest of the Crucible Steel Company of America, bought land a year ago with the intention of putting up an open hearth plant of their own. It is the intention of the Crucible Steel Company of America to build open hearth furnaces to give an annual output of about 250,000 tons of steel or more. It is probable that the plant will eventually contain 12 50-ton furnaces, but at the start out a smaller number will be built. This open hearth plant will be operated under the name of the St. Clair Steel Company, and will be a constituent interest of the Crucible Steel Company of America. The officers of the Crucible Steel Company of America will reorganize the firm of Anderson, DuPuy & Co. as the Anderson-DuPuy Company, with a Pennsylvania State charter, in order that the stock of the plant may be owned by the consolidation and be more easily handled. The firm were taken over by the Crucible Steel Company of America, but as a partnership, and a stock company will be a more satisfactory arrangement.

The mine consists of three 40-acre tracts of land, the ore deposit lying in the two north forties. In 1895 there had been cut a pit to the ore in the southwest corner of the west forty, covering 7 or 8 acres, from which all the mining up to that time had been done, amounting to about 450,000 tons. Running up through the center of the east forty was cut a channel down to the ore 100 feet wide and 1000 feet long. Not far from 1,000,000 cubic yards had been removed from the mine in these operations, which, with their systems of tracks, prestles,

Of the illustrations here shown that of the through cut, Figs. 2a and 2b, which are halves of one photograph, is taken from the north crest and shows practically the entire mine as opened since 1895, the pit partially shown at the west in which the water is standing being the original west cut, made prior to 1895. Three steam shovels are shown in the illustration working on the third and fourth levels of the stripping, which is at the center about 75 feet thick. Below the center shovel, and to some extent also below that to the west, is a body of lower grade ore of considerable thickness, and from 700 to 800 feet east and west that is being cleared off to reach a higher grade ore below. This ore is put aside by itself in hope that it may come into use at some future time, and as it runs much above 50 per cent. iron, some indeed above 55 per cent., there would seem to be a possibility that if in time furnaces are established so near the mine as to cut off much of the shipping charges it may be utilized. Up to quite lately this ore had been wasted in the dumps. It is the presence



The mining equipment of the Biwabik includes three shovels, two of which are 85-ton and one a 65-ton Bucy-



rus. These three shovels during the present season have mined from its natural bed 915,000 gross tons of ore, working day shift. In a single month they mined 205,000 tons. One of them in ten hours loaded 185 29-ton cars, or 5365 tons. The Biwabik Mining Company have also an equipment of standard locomotives to

There are several enormous stripping dumps at this mine that show what has been done to make it the property it is to-day. One of these is the product of the present season. It is 1500 feet long and averages 400 feet wide and 40 feet deep and contains more than 650,000 cubic yards. This dump is reached by a trestle half



Fig. 3.—West Cut in Foreground.—Shovels at Work in Ore and Overburden for Through Cut.



Fig. 4.—Looking East into Through Cut, Completed.

serve these shovels and pull the ore out of the mine. The shipment of the mine this year has been nearly seven-ninths No. 1, guaranteed 63.75 iron and 0.040 phosphorus, one-ninth No. 2, guaranteed the same in iron and 0.005 higher in phosphorus, and one-ninth No. 3, the same in iron and 0.005 still higher in phosphorus. There has been also some small shipment of ore running lower in iron and high in phosphorus.

a mile long and is on a large tract of land secured by the company for the purpose. The other dumps are upon the south forty of the mine and contain considerably over 2,000,000 yards. The stripping contractors, the Drake & Stratton Company, have an outfit at this mine of five large steam shovels, 17 Porter locomotives and a large number of dump cars holding about  $2\frac{1}{2}$  yards each. They have employed this summer between

500 and 600 men. The grade from the lower shovels to the dump is such that three of these small locomotives are required to pull seven cars to the top.

East of the Biwabik mine lies the Williams, and south of the east forty is the Cincinnati. These two mines are idle; Williams ore runs about 57 per cent. iron and Cincinnati does not appear to have any large deposit. To the west of the south forty is the Canton and just north and to the west of the north forty is the Duluth. The latter is a part of the Biwabik ore deposit and has been shipping steadily until its surface improvements were destroyed by a cyclone in October. It belongs in fee to the Rockefeller company. The Canton is not of a class of ore easily sold and has been idle some years. It is a fee property of the Minnesota Iron Company.

The Biwabik belongs in fee to J. M. Williams, a wealthy lumberman of Chicago, and an original lease is held by the Lake Superior Consolidated Iron Mines, the Rockefeller company. Mr. Williams receives a royalty of 20 cents a ton and the Consolidated company 10 cents and the traffic of the mine. The Biwabik Mining Company are controlled by Tod, Stambaugh &

1900, and \$11,857,600 in November of last year. The total fire waste for the 11 months ended November 30 falls just below \$152,000,000, or nearly \$30,000,000 in excess of the loss for the corresponding period of 1899 and \$46,000,000 larger than that of 1898. The fire underwriters are looking forward to very discouraging annual statements for 1900.

#### Surveys for the Pacific Cable.

One of the chief topics likely to be brought before the next Congress is the laying of the Pacific cable, and the matter is occupying no small amount of time on the part of the various Government bureaus interested. In the annual report of Rear Admiral R. B. Bradford, Chief of the Bureau of Equipment, Navy Department, just made public, considerable space is devoted to the survey of the Pacific Ocean to determine the most feasible route for a telegraph cable connecting the United States with the Philippines. Submarine peaks and chasms were discovered by the surveyors. Last year the surveying ship "Nero" established the fact that a practicable cable could be laid across the Pacific. Later

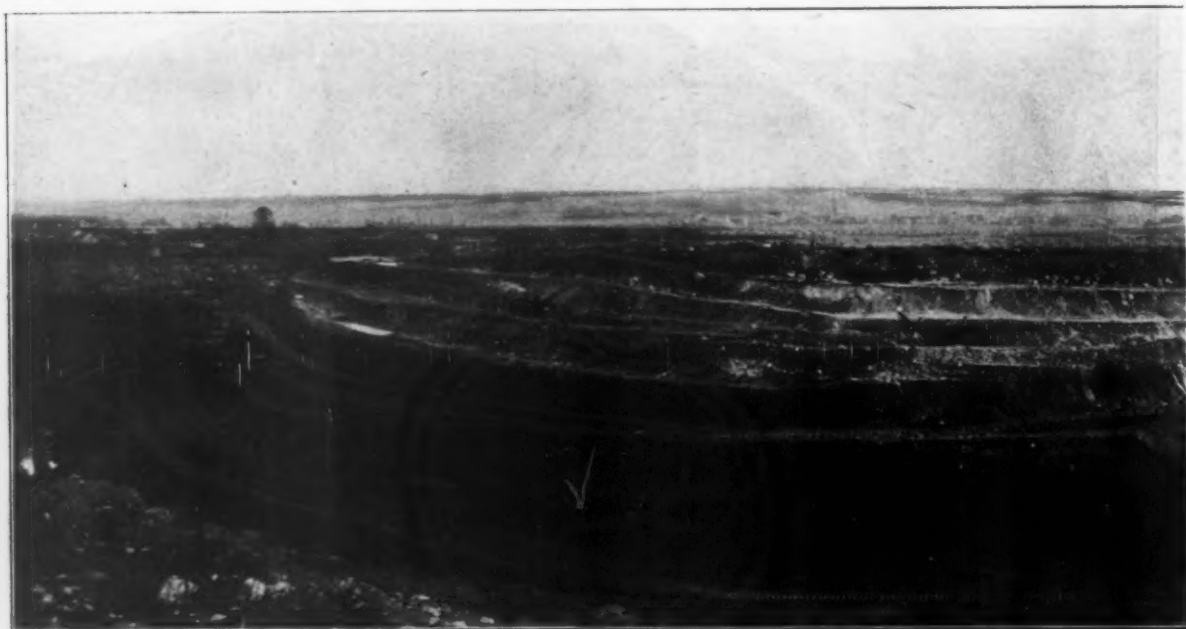


Fig. 2a.—General View of Biwabik Through Cut.

Co., and a number of the large steel making consolidations have stock interests. The mine has shipped this season its entire sales of the early year.

#### National Roofing and Corrugating Company.

The American Sheet Steel Company, it is announced, have entered into an agreement with the National Roofing & Corrugating Company of Wheeling, W. Va., whereby the last named concern agree to purchase all their raw material from the American Sheet Steel Company, that company in their turn stipulating not to engage in the manufacture of sheet steel roofing. A meeting of officials of the two companies was held last week in Wheeling, at which the agreement was concluded. The National Roofing & Corrugating Company, it will be remembered, were organized last summer with an authorized capital of \$5,000,000 to consolidate certain of the concerns manufacturing iron and steel roofing, cornices, metal ceilings, &c. C. E. Needham of Cleveland, Ohio, is the president of the company. The report that the American Sheet Steel Company contemplate absorbing the National Company is declared to be without foundation.

The November fire loss of the United States and Canada is computed by the *New York Journal of Commerce* at \$8,518,000, as compared with \$7,107,000 in October,

last year and this year surveys have been conducted to discover a practicable route between Guam and Yokohama, Japan, and from Dingala Bay, Island of Luzon, to Guam.

The zigzag survey from Dingala Bay to Guam was completed on September 7 last year. The "Nero" sailed from Guam on September 9, and arrived at Yokohama on September 24, having run a line of soundings at close intervals between the two ports along a route 1332 knots in length. After leaving Yokohama on October 10 the "Nero" made a zigzag or traverse return survey to Guam, arriving there on November 2. On November 12, the zigzag survey toward the United States was resumed. It was completed to the Midway Islands on January 3, 1900, and to Honolulu, January 29, 1900.

Mention was made in last year's report of an obstacle in the nature of a submarine abyss on the route between the Midway Islands and Guam, not far to the eastward of the latter. This abyss, which is the deepest yet discovered in the world, was then only known to be of a greater depth than 1900 fathoms. It now appears that, on the trip of the "Nero" to the westward, while attempting to sound, 4913 fathoms—or 29,478 feet—of the sounding wire, all that was on the reel, were unwound without reaching bottom.

Upon leaving Guam, November 19, 1899, on the trip to the eastward Lieutenant Commander Hodges made further explorations in this locality, now known as the Nero Deep, which confirmed the previously announced



conclusion regarding the necessity for deflecting the cable route from the Midway Islands to Guam, and added to the knowledge of the greatly depressed area already referred to. This region, the extent of which the survey has well defined to the northeastward, afforded an opportunity for the "Nero" to make the two deepest casts and take the two deepest water temperatures ever recorded. The depths found were 5160 fathoms and 5269 fathoms, and the temperatures were 35.6 degrees F. at 507 fathoms and 36 degrees at 5101 fathoms.—*Electrical World*.

#### Sheet Mill Machinery Agreement.

The announcement that the American Sheet Steel Company have entered into an agreement with the manufacturers of rolls to take the whole of their output for the next five years, on condition that they make no machinery for independent concerns, is interesting, in view of the fact that quite a number of companies have recently been organized to put up independent sheet mills, while some of the sheet manufacturing concerns now

has already expired without being acted upon. Plans for at least four considerable sheet mill plants have been recently reported, for the erection of which strong companies have been organized.

#### A Model Town on the Delaware.

On some desirable site along the Delaware River a combination of Philadelphia manufacturers, whose industries afford employment to large numbers of skilled mechanics, will found in the near future what they hope will prove the model town, not only of America, but of the world. The *New York Times* reports that the first steps toward the carrying out of the important project were taken at a dinner given in Philadelphia a few nights ago by Joseph J. Byers, who is the leading spirit in the enterprise. Mr. Byers was formerly a New Yorker and is now a leading financier of the Quaker City. The project which Mr. Byers is seeking to promote is not the outgrowth of purely philanthropic or altruistic sentiment, but an evolution from business conditions. There are, it seems, several large manufacturers in and around Philadelphia who have recently reached the conclusion



Fig. 2b.—General View of Bixabik Through Cut

operating outside of the combination are reported to be contemplating the making of additions to their equipment. The report comes from reliable sources and is generally credited, although those immediately concerned decline to affirm or deny it.

The agreement is understood to include all the foundries making sheet mill equipments, with possibly one or two exceptions. It is similar to the one made last year between the makers of tin plate machinery and the American Tin Plate Company, which runs until 1904. The sheet agreement will be terminated on January 1, 1905. It provides that the American Sheet Steel Company will take all of the output, in specified lines, of the foundries concerned, provision being made to regulate the character and output of each foundry. A committee of foundrymen is to be appointed to oversee the allotment of work, and orders will be distributed proportionately among the different concerns.

This move on the part of the sheet combination has, of course, been made in order to shut out the competition of new firms in their line, and it is more than likely to cause embarrassment to the newly organized sheet mill companies. When the tin plate agreement was made last year it was stipulated that options which had been given to certain prospective tin plate manufacturers be honored, if closed. Some of these options were exercised, while others lapsed. In the case of the sheet mill agreement, it is said, only one option was out, and that

that a combination of their industries would be conducive to their mutual profit.

The great obstacle in the way of effecting such a combination was the question of bringing about a physical as well as a legal coalition of these industries. It was this problem which suggested to Mr. Byers the starting of a model town. When the model town idea had once been turned over in his mind Mr. Byers saw no reason why the combination which was at first contemplated should not be broadened so as to include industries which were not thought of in the original scheme. The outcome of his consideration of the subject was the dinner, to which a number of employers of labor on a large scale were invited, and also several gentlemen whose experience in movements of the character which he wished to start would be valuable. Among those who were present at the dinner were William H. Armstrong, former United States Railroad Commissioner; Howard Butcher of the Southern Cotton Oil Company; Elgin R. L. Gould, president of the City & Suburban Homes Company of New York; Clarendon I. S. Gould of Baltimore, Robert Ogden of the firm of John Wanamaker & Co., Theodore C. Search, president of the National Association of Manufacturers; Spencer Trask, a New York banker, who is also an officer in the Social Service League, and William D. Winsor of the Boston & Philadelphia Steamship Company.

Dr. Elgin R. L. Gould, in speaking of the project yes-

terday, said to a representative of the New York Times:

"A committee to draw up a plan for the proposed model town was appointed, and I have no doubt that a practical result will be achieved. Those who are in the movement hope to establish an industrial town which will be an advance upon anything of the kind yet attempted. They are impressed with the belief that out of the light afforded by similar experiments, both in America and in Europe, they will be able to inaugurate an enterprise which will go further toward establishing right relations between capital and labor than anything that has yet been done. They will avoid the mistakes made in the Pullman project, which, while undoubtedly an advance upon old conditions, contained flaws which prevented a perfect success. While the workmen at Pullman were well housed and enjoyed advantages superior to those they had formerly known, they were always confronted by the impossibility of ever owning their homes at Pullman, and, moreover, the fact that there was no limitation upon the earnings of the town occasioned discontent.

"In the new model town which it is contemplated laying out on the banks of the Delaware, every workman will be encouraged to purchase his own home, and the earnings of the town company will be limited to 5 per cent. All that is earned above that, which is more than a reasonable return on the investment, will be put into a fund to be used for the benefit of the entire community."

"What advantages do the manufacturers expect to reap from the project?"

"Their expectation is that by the establishment of the model town, and the inducements which it offers to the thrifty and well intentioned workman, they will attract to their industries the very best and most desirable class of labor. They are working out an economic problem. At the same time they are, of course, moved to some extent by the altruistic spirit. That spirit is growing in the United States rapidly. Already it has worked some great innovations in Germany and France, and particularly in England, where it has apparently taken deep root. It is destined to be the spirit of the twentieth century. The notion that an employer's duty to his employees ends when he pays them their salaries is rapidly going out of date. The tendency is to establish closer and better relations between employer and employees. It has been demonstrated in many instances where this has been done that it results in mutual advantage. Of course the problem is one which cannot be worked out in a year, or in a decade, but the advance which has been made along the line of mutuality of interest has been more than sufficient to raise sanguine expectations that the day is not far distant when as perfect an understanding as is possible to human nature will exist between skilled labor and the men who employ it."

#### A Franklin Institute for Boston.

At length the long discussed question of the disposal of the Franklin Fund in Boston seems to have been finally decided. Boston is to have a Franklin Institute modeled in a general way after the Cooper Union of New York. It will be remembered that a sum of five thousand dollars was left in 1794, by Benjamin Franklin's will, the accumulations of which for one hundred years were to go for the benefit of the people of the city of Boston, with special regard to the instruction of young mechanics. For six years the use of this fund, which now amounts to nearly four hundred thousand dollars, has been a matter of dispute. The Boston Board of Aldermen, who are its trustees, were unable until quite recently to agree upon the disposition of the money. Some of those interested in the matter wanted the money devoted to a great lecture hall. Others desired its use for public baths and gymnasiums. At one time it was thought likely that it would be used to found a trade school. But all these differences are now ended in an agreement to build a Franklin Institute on the site of the old Franklin school house. The land is to be given by the city, and a branch of the free public library will be established in the Institute. Classes and lectures of various kinds will be provided, much on

the lines followed at Cooper Union. Probably this is the most useful disposition that could be made of the fund and one that will be pretty closely in line with the educational ideas of the famous testator. The trade school question, fortunately, has been taken up in a practical way by the Massachusetts Charitable Mechanics' Association, so that the pressing need for an institute of that kind is in course of being met. The only question in regard to the new institution seems to be in connection with its title. If it is to be called the Franklin Institute, it may become confounded in the public mind with the time honored institution of that name in Philadelphia, which is really national in its scope.

#### The Patterson Friction Disk Driven Drill.

The drill designed by the Patterson Tool & Supply Company of Dayton, Ohio, is provided with a friction drive which admits of a wide range of speed and large drilling capacity. The friction plate has a hub which runs in a ball bearing on the main frame. This plate is



THE PATTERSON FRICTION DISK DRIVEN DRILL.

brought in contact with the driving wheel by an eccentric ring, quickly and easily moved and locked in position. The driving wheel is built up of paper, clamped between two disks. Variation in speed of the spindle is obtained by moving this wheel to and from the center of the friction plate, and it is secured in the desired position by the thumb set screw shown on top of the frame. A ball bearing between the collar on the spindle and sleeve does away with practically all friction from end thrust. The table is counterbalanced by a weight in the column, and can be swung to either side, and locked in position by a wrench. The column is graduated by a vertical line its full length, making it easily possible to set the center of the table in line with the spindle at any point of vertical adjustment. The countershaft is bolted to the base, has tight and loose pulleys and a two-step cone pulley. The principal dimensions are: Height from base to spindle, 40½ inches; from table to spindle, 33½ inches; distance from column to spindle, 7¼ inches.

A diamond circular saw that is said to cut hard sandstone blocks at the rate of 5 feet per minute is described in *London Engineering*. The saw has dovetailed recesses in which are fitted steel blocks, each containing a diamond. A hole is drilled into the block, but stopped be-



fore running through. A diamond is dropped into the hole, and a steel wire peg driven in behind it. The block is then put in an electric welding machine, and when it is softened, pressure is applied until the diamond is firmly gripped and the steel peg is welded into place. The front of the block is then filed away until the diamond is exposed, and the sides are milled to fit the dovetailed recesses in the saw. The positions of the diamonds in the blocks vary, so as to enable the saw to clear itself in making the cut.

## The Ship Subsidy Bill.

WASHINGTON, D. C., December 11, 1900.—The friends of the ship subsidy measure now pending in Congress have succeeded during the opening week of the session in placing the Senate bill, which was reported at the last session, in the position of "unfinished business" in the Senate, and already several days have been devoted to its discussion. The House bill, which has also been favorably reported by the House Committee, is now on the calendar, but in view of the ability of the managers of the measure to bring it up at any time under a special order from the Committee on Rules, there is a disposition not to urge action in the House until an opportunity has been afforded to test the strength of the measure in the Senate.

### The Position of the Advocates.

The position of the advocates of ship subsidies in both Houses is succinctly set forth by Chairman Grosvenor of the House Committee on the Merchant Marine as follows:

"We have considered practically every other method of stimulating the growth of our merchant marine. The proposition that we should adopt discriminating duties on imports had to be abandoned, because all our existing treaties with every commercial nation on the globe distinctly forbade them. A bounty on our exports has also been suggested, but if these bounties should be paid only on exports in American vessels we would again contravene our treaties, more than 20 of which, in terms, prohibit such a proceeding. If these bounties were paid to exports in vessels of all nationalities, the American shipbuilder would be in exactly the same position that he is to-day, as his foreign competitor would enjoy the lion's share of the advantage. The proposed remedy of 'free ships' has been abandoned as not only repugnant to the feelings of the people, but as immensely injurious to our welfare in case of foreign difficulties, and it hardly need be said that such a policy is absolutely in contradiction of the theory and effect of every tariff law that has been passed from the beginning of our Government, without regard to the dominant political party.

"Perhaps the proposition of postal subsidies has seemed to offer more encouragement than any of the other plans referred to, but it has been pointed out that nothing could be accomplished unless subsidies could be offered and paid to vessels running to 40 or 50 different ports in foreign countries, without regard to the amount of mail service and large enough to pay the expense of building and running the ships for the subsidy added to such commercial business as could be obtained. American trade at these particular ports could doubtless be largely increased, but at an expense immensely greater than the total sum provided to be paid by the pending bill. In addition, such subsidized lines would become monopolies, which are contrary to the spirit of the proposed legislation.

"We come, therefore, to the plan which underlies the pending bill as the only one which offers an adequate remedy for the deplorable condition of our merchant marine. The principle we have adopted is that our export trade shall be open on the same terms, so far as it is assisted by the policy and money of the United States, to every one of our citizens who may choose to engage in it and upon terms of equality to all, according to the services rendered. If enacted into law this bill will in due time give us a vastly increased merchant marine and an enormously increased sale in both old and new markets of the products of our great republic, and at

the same time will give us a great fleet of vessels auxiliary to our navy and indispensable to our operations in time of war."

### The Subsidy Bill Criticised

The opposition to the pending subsidy bills in both Houses is divided between those who favor the free importation of ships and those who maintain that the pending measures will not realize the expectations of their framers. The advocates of free ships have framed an amendment to the Senate bill which has already been presented by Senator Vest. They are confined exclusively to the Democratic side, but a considerable number of Republicans in the House and several Republican Senators have expressed their opposition to the House and Senate bills in their present form. The chief criticisms of the measures are set forth in the minority report of the House Committee, the signers of which oppose the House bill for the following stated reasons:

"1. Because subsidies are graded according to the speed and capacity of ships, and are more than twice as high per ton of capacity for the swift passenger steamers, which carry but little cargo, as for ordinary freight steamers, which carry 80 or 90 per cent. of our exports. The subsidy, therefore, if it affects rates at all, will affect passenger rather than freight rates. Yet it is only by lowering freight rates that subsidies to shipping can increase trade and commerce.

"2. But if the statements of Mr. Griscom of the International Navigation Company and of Mr. Clyde of the Clyde line be true, that 'the compensation is only adequate to equalize the difference in the cost of building and operating vessels under our flag and that of doing the same under foreign flags,' then it follows that the subsidy could have no effect upon either freight or passenger rates, though it might cause more freight and passengers to be carried under the American flag. And if the full subsidy permitted by the bill is bare compensation, and therefore offers no inducement whatever to increase our shipping, what will happen when, in a few years, the \$9,000,000 limit is reached and the rate of subsidy has to be reduced?

"3. As only about 5 per cent. of the total tonnage of the world's shipping is subsidized, and as nearly all of the present subsidy goes to passenger and mail steamers, the hopelessness of trying by subsidy to lower freight rates and increase commerce is apparent. Unlimited subsidy would be necessary to lower general freight rates. If any one country attempts by subsidy to secure lower rates, the subsidy must go to all ships carrying freights. Otherwise, the moment the few subsidized ships lower rates for one country the unsubsidized ships (tramp steamers, &c.) will withdraw to other service and rates for this particular country will go back to the world's level. Hence it is practically beyond the ability of any one country to materially reduce by subsidy its ocean freight rates and in this way to increase its foreign trade.

"4. The bill does not sufficiently provide for subsidies based upon the amount of freight carried, nor does it require any decrease in freight rates. It offers no guaranty of more shipping, more freight, or lower freight rates. As explained later, the 'cargo' amendment is so loosely drawn that it can easily be evaded. It will therefore be possible for ships to run practically in ballast and to draw subsidy. As we demonstrate later, it will pay a certain class of ships, of which several are now being built, to run in ballast in order to get the subsidy.

"5. It cannot be shown, from the history of subsidies, that they ever materially lowered freight rates or increased the commerce of the countries granting them. On the contrary, it appears that the most heavily subsidized lines of the different countries usually give discriminating rates in favor of foreign shippers and charge their home traffic, of which they usually have practically a monopoly between certain ports, all it will bear. There is certainly no evidence showing that subsidized lines discriminate in favor of the nation whose flag they carry, or that foreign rates depend, in any way, upon the nationality of either ships or goods. Trade conditions and not trade theories fix the rates which shippers will pay, and which ship owners can get.

"6. Neither does the history of subsidies show that any country has ever built up its merchant marine in this way. Our experience with the Collins, Brazil and Pacific Mail lines is the present experience of France and Italy and the past experience of all other countries which have given real subsidies."

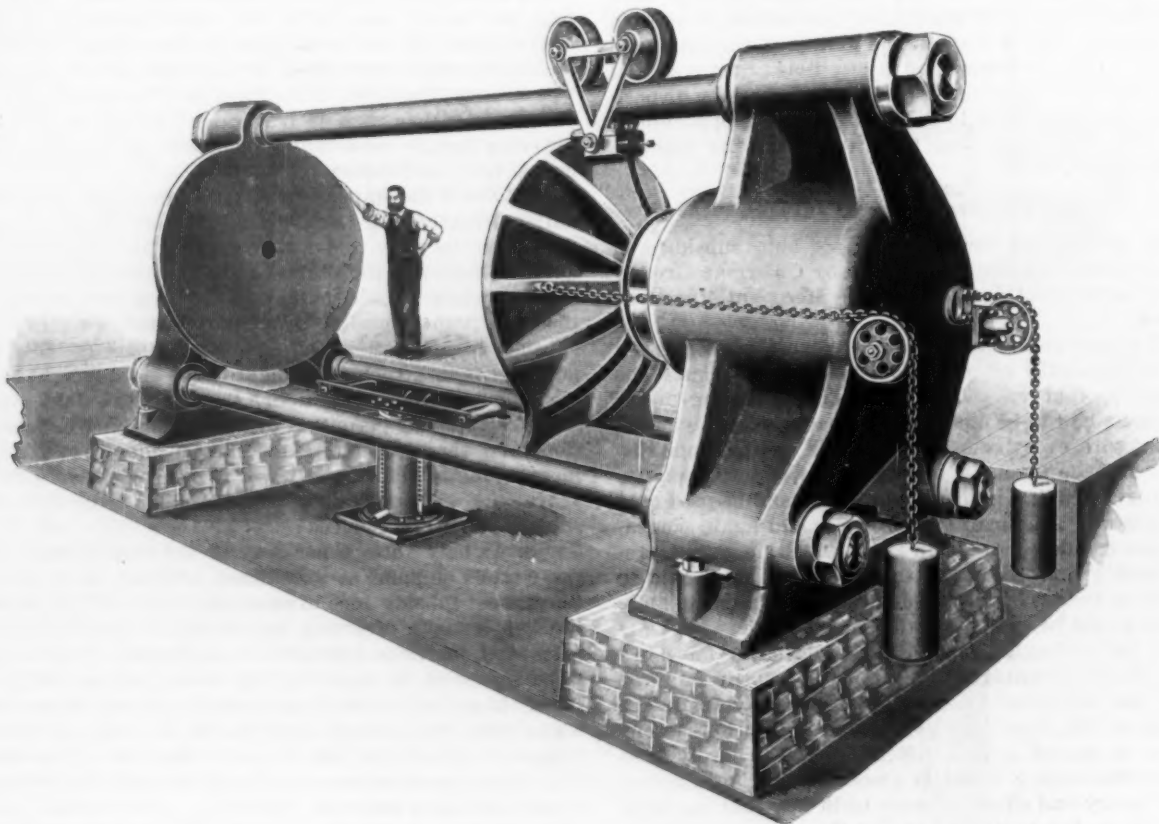
#### The Chances of the Bill.

The fate of the subsidy proposition at the present session is believed to depend upon the tactics of its opponents in the Senate. A careful canvass made by the friends of the measure is claimed to show a safe majority for the Senate bill, but as there is no provision in the Senate rules for bringing a bill to a vote as long as any Senator desires to speak upon it, it is clear that a determined minority, by adopting filibustering tactics, might prevent action before March 4, when the present session expires. Senator Pettigrew, the leader of the opposition, has already announced his intention of ex-

#### The Waterbury Farrel Horizontal Pipe Tester.

We here illustrate a machine of unusually large size designed by the Waterbury Farrel Foundry & Machine Company of Waterbury, Conn., for testing pipe up to 60 inches in diameter under a pressure of 350 pounds per square inch on the largest size. The longest pipe the machine will test is 151 inches. The machine has a stationary head 84 inches in diameter, the traveling platen being 74 inches in diameter. The ram is 36 inches in diameter and has a stroke of 19 inches. The cylinder pressure is 1600 pounds to the inch. The extreme height of the machine is 13 feet, the height from the floor being 8 5-6 feet and the floor space occupied is 7 x 26 feet. The weight, without lift, is 96,400 pounds.

The stationary head is connected by three horizontal tie rods to the cylinder head which contains the ram that is shown suspended from the rollers on the upper tie rod. The heads and base plates are of cast iron, the tie



THE WATERBURY FARREL HORIZONTAL PIPE TESTER.

hausting all resources to prevent the passage of the Senate bill. That he can accomplish this result single handed is extremely doubtful, and evidence is yet lacking of an intention on the part of other opponents of the bill to filibuster in order to defeat it. So many measures are pressing for consideration, however, that prolonged debate must necessarily imperil the bill. A canvass of the House indicates that with some amendments not regarded as vital by the friends of the bill it can be passed by a substantial majority.

W. L. C.

Stanley G. Flagg & Co., manufacturers of Malleable Castings, of Philadelphia, Pa., advise the trade that they have added to their works at Stowe, Pa., a Malleable Castings foundry suitable for making heavy Castings in quantities, and they add that they are in a position to quote satisfactory prices and make prompt deliveries. The company say that they make only orders in quantities from full gates of patterns, and are prepared to quote prices under these conditions. Persons desirous of having quotations on work of this class will be attended to if they will send their samples to the works at Stowe, Pa., or the company will have their representative call and see the character of the work upon which the prices are solicited.

rods forged steel, with nuts made from steel castings. The ram is rubber packed.

The operation of testing a pipe is as follows: The pipe is run out from the floor on skids over the pit until it is in the middle of the machine. The lift, described below, is started up and the cradle on its top lifts the pipe off from the skids and centers it in the press. The traveling head is moved forward against the end of the pipe and the force exerted by the ram seals both ends of the pipe by pressing it against suitable gaskets held on the heads. Water is run into the pipe from a tank and when full the test pressure is applied from an accumulator. After the test the pressure on the ram is released and the counterweights draw the traveling head back, the water in the pipe falling into the pit. The lift is lowered and the pipe set on the skids and rolled away.

The lift is of 12½ tons capacity, and is operated by water under a pressure of 125 pounds per square inch. The ram is 16 inches in diameter, 23 inches stroke. It has sufficient range so that 24-inch pipe can be centered in the press by its use.

#### The Hydraulic Accumulator.

The accumulator shown in the second engraving is employed with this press. This machine is of the mov-



able plunger type with cheese weights. All parts are cast iron, except the gland, which is bronze, and the weight rods and cylinder bolts, which are wrought iron. The cylinder sections are lead packed, the plunger flax packed. The moving parts are guided by the plunger working in the top and by the weight ring sliding against rails held by the cylinder. The base has a widespread foot, which is bolted to a foundation. The machine is fitted with a buffer safety valve, so designed that if a break occurs in the piping and the weights fall, they

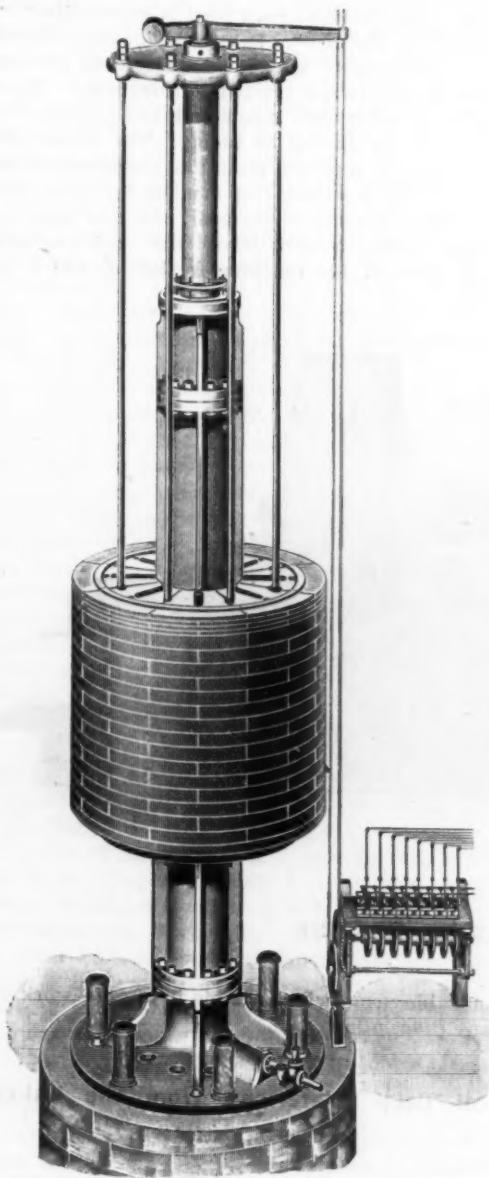


Fig. 2.

THE WATERBURY FARREL ACCUMULATOR USED  
WITH PIPE TESTER.

are caught by the valve and gently brought to rest on the supports.

A fire which occurred early on Wednesday morning at the Morton works of the American Tin Plate Company, at Cambridge, Ohio, destroyed the finishing department, four sets of cold rolls, the pickling department and a warehouse filled with finished products. Considerable machinery was also damaged, and a number of cars on sidings were burned. The damage is estimated at about \$200,000. The mills had lately resumed after a long idleness. A Chicago dispatch states that the company carried \$100,000 of insurance on the Cambridge plant.

A bill for the admission of the Territory of Oklahoma to Statehood has been introduced into Congress by Senator Fairbanks of Indiana.

### Federal Bankruptcy Legislation.

WASHINGTON, D. C., December 11, 1900.—The necessity for determining whether the Federal bankruptcy act shall be amended at the present short session in accordance with the recommendations made by the Attorney-General and the National Referees' Association, recently published in *The Iron Age*, has been emphasized by two incidents of the first week of the session. The most significant of these is the presentation in the Senate by Senator McCumber of North Dakota of a carefully drawn bill providing for the repeal of the act, guarded by provisions designed to protect the rights of all who may be parties to bankruptcy proceedings at the time the law is stricken from the statute books. The other incident referred to is the action of the United States Supreme Court in advancing the appealed case involving the question of the proper interpretation of section 57 (g) which has been held by several courts to require the refunding of all payments made by an insolvent within four months of the filing of a petition in bankruptcy, even though such payments may be shown to have been made in good faith and in the ordinary course of business.

Senator McCumber's bill provides that on and after a date to be determined upon the passage of the bill the present Federal bankruptcy act shall stand repealed with the following proviso:

"Provided, however, that such repeal shall in no manner invalidate or affect any case in bankruptcy, instituted or pending in any court prior to the date when this act shall take effect; but as to all such pending cases and all future proceedings therein, and in respect of all pains, penalties and forfeitures which shall have been incurred under said act prior to the date when this act takes effect, or which may thereafter be incurred under any of those provisions of said act which, for the purpose named in this act, are kept in force, and all penal actions and criminal proceedings for a violation of said act, whether then pending or thereafter instituted, and in respect of all rights of debtors and creditors (except the right of commencing original proceedings in bankruptcy), and all rights of and suits by, or against, assignees, under said act, in any matter or case which shall have arisen prior to the date when this act takes effect, or in any matter or case which shall arise after this act takes effect in respect to any matter of bankruptcy authorized by this act to be proceeded with after said last mentioned date, the act hereby repealed shall continue in full force and effect until the same shall be fully disposed of in the same manner as if said act had not been repealed."

The date of September 1, 1901, is tentatively fixed as the time when the present act shall stand repealed, but as above stated, it is the intention that this date shall not be finally determined until the repealing bill is put upon its passage. Senator McCumber, the author of this measure, is a new Republican Senator now serving in his first Congress, but is prominent in the councils of the majority, and is rated as a good lawyer. His action, therefore, has caused considerable uneasiness among the friends of the Federal statute, who, although their views concerning the efficiency of the law have not been modified, are inclined to think that the time is not now propitious for attempting to amend the statute. On this point, Chairman Ray of the House Judiciary Committee, one of the authors of the present law, said to the correspondent of *The Iron Age*:

"There can be no doubt that the present law needs amending to strengthen its involuntary features, and I heartily agree with the Attorney-General's recommendations, especially with reference to restricting the right of an individual to become a bankrupt more than once without producing an increasing proportion of assets to liabilities. If the way was entirely clear I should lose no time in reporting a bill to amend the law, but in view of the attitude of certain members of the House such a measure would probably require to be passed under a special order, and I doubt if we have votes enough to put through a satisfactory bill in any other way. I am therefore disposed to wait until the Fifty-

seventh Congress, when the present majority will be materially increased in both House and Senate. Should a bill be brought forward now, amendments might be voted into it emasculating the whole statute, for while the present law needs strengthening in its involuntary features the advocates of a purely voluntary law are eager to throw out every feature of advantage to the creditor interest."

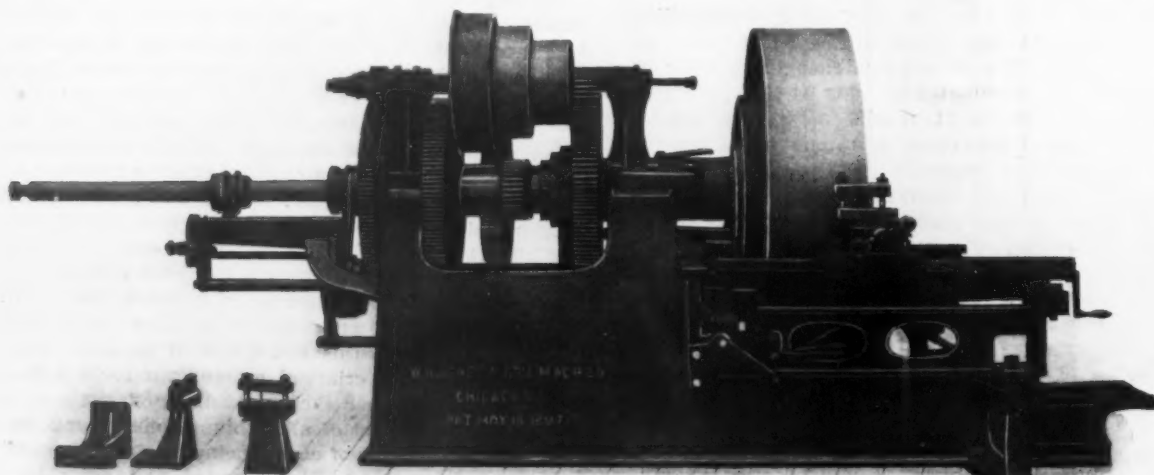
In view of the considerations set forth by Mr. Ray, he will consult with his colleagues and decide in a few days whether any attempt shall be made at the present session to amend the law. In the meantime the Supreme Court will hear the case involving the proper construction of section 57 (g) relating to payments on account, and when that is decided the necessity for amending that important feature of the act may be removed.

W. L. C.

### The Foss Boring and Turning Machine.

The Foss boring and turning machine, or special chucking lathe, built by the W. A. Jones Foundry &

thus driving it at its slowest range of speed. The intermediate shaft slides endwise in its bearings, throwing both its gear and pinion out of mesh, and it is here shown in this position. A pinion on the other end of the cone shaft slides into mesh with the large gear of the spindle for its faster range of speeds. The lathe has a tool carriage slide on each side, only one of which appears here, the two being arranged so that they may be adjusted from one side to close or open for any diameter of work. The top guides are provided with compound tool post heads which can be set to turn straight or taper in either direction. The tools also each feed in either direction independently of the other. In turning pulleys, therefore, the cuts may both be started at once from the middle and each feed outward toward its own edge. There is also another adjustable compound tool carrier which may be used for boring or facing. The feeds for the tools are entirely separate from and independent of the bar feed. There is a three-step cone on the main spindle, seen through the arms of the gear, and this belts to another cone below, which drives the feed mechanism. The face plate of the machine is slotted, and is fitted



THE FOSS BORING AND TURNING MACHINE.

Machine Company, North avenue and Noble street, Chicago, is here illustrated. The machine is designed for boring and turning pulleys, sheaves and the like, all the work being done while the wheel is held to the face plate. The lathe swings 54 inches in diameter and works to a width of 48 inches. Through the main spindle, which is 5½ inches in diameter, runs a boring bar 2 15-16 inches in diameter, in an adjustable taper sleeve. The boring bar may be rotated in either direction, which gives it considerable variation in cutting speeds relatively to the work. When boring large holes it will run in the same direction as the spindle, while for small holes or light cuts it will run in the opposite direction. The bar may be made to feed in either direction. The bearing for the front end of the bar is not needed, except for long holes and heavy work. The bar slides with a feather through the large gear, which is reversibly driven by tumbling gears which connect it with the small gear on the cone pulley shaft. The boring bar feed train is driven by a two-step cone outside the large gear. The rotation of the feed screw is reversible and the feed nut opens so that the bar may be moved back and forth. The machine is run with either compound or triple gearing, according to the speed required. For the triple gear the pinion on the cone shaft at the large end of the cone is slipped into mesh with the large gear below it, as shown. The sliding of the pinion is done by the rod projecting from the end of the shaft. This large gear turns freely on the main spindle, the other end of the sleeve to which it is fastened carrying a pinion which meshes into the large gear on the intermediate shaft, and a pinion on this shaft engages a large gear on the front of the spindle,

with movable arms which enable it to take work of almost any description.

### Cost of Deep Waterway from the Lakes to the Atlantic.

The report of the Deep Waterways Commission sent to Congress last week by Secretary Root gives the result of an investigation made by the commission of the practicability of constructing a ship canal between the great lakes and the Atlantic Ocean. The estimated cost of a 21-foot waterway is placed at \$206,358,000, and of a 30-foot waterway at \$317,284,500. The cost of annual maintenance of the 21-foot waterway is placed at \$2,343,478, and of the 30-foot waterway, \$2,930,308.

The most favorable route, the commission says, for a 30-foot waterway from the lakes to the sea is from Lake Erie to Lake Ontario, by way of Lasalle and Lewiston, and from Lake Ontario to the Hudson River by way of Oswego and the Mohawk Valley, and that the same route practically is as favorable as any for the 21-foot waterway. It also is pointed out by the commission that this route is entirely in our own country. The following conclusions are stated: "As the result of this investigation it appears that the 21-foot waterway promises a much greater return of value relative to its cost than the 30-foot waterway. The main advantages of the 30-foot waterway are that it would furnish the lower cost of transportation proper to foreign markets and permit the construction of the largest sea going vessels on the lakes."



## The New War Ships.

WASHINGTON, D. C., December 11, 1900.—The Secretary of the Navy on the 7th inst. opened bids for the largest amount of naval construction for which proposals have ever been received at a single opening in the history of the country, the aggregate of the proposed contracts approximating \$50,000,000 and covering five battle ships and six armored cruisers of the latest type. The event brought to Washington some of the most prominent representatives of the shipbuilding industry and metal trades, among whom were Henry Scott of the Union Iron Works, Chas. and Edwin Cramp of the Cramp Ship & Engine Building Company, President Morse, Manager Newmann and John Lindsay of the New York Ship Building Company, Louis Nixon of the Crescent Works, President Olcott, Attorney Payson and Manager Post of the Newport News Ship Building & Dry Dock Company, President Taylor and Mr. Tarbett of the Risdon Iron & Locomotive Works of San Francisco, John Dialogue of Camden, N. J.; F. O. Wellington and H. T. Elwell of the Fore River Ship & Engine Company of Quincy, Mass.; the Messrs. Moran of Moran Bros. & Co. of Seattle, Wash.; Mr. Trigg of the Richmond Locomotive Works, Manager Clark of the Niles Tool Company and others. The large attendance and great interest displayed were stimulated not only by the opportunity presented to bid on the 11 vessels under consideration, but also because of the enormous amount of subcontract work involved in the proposals.

The most significant feature of the proposals which were submitted by nine prominent concerns was the appearance in the list of competitors of the Fore River Ship Building & Locomotive Works and the two Pacific Coast concerns, Moran Bros. & Co. of Seattle, Wash., and the Risdon Iron & Locomotive Works, none of which companies have ever before made bids for constructing armored ships. The official summary of the proposals is as follows:

### Battle Ships.

William Cramp & Sons Ship & Engine Building Company, Philadelphia, act of March 3, 1899, one sheathed battle ship, \$3,600,000.

Newport News Ship Building & Dry Dock Company, Newport News, Va., act March 3, 1899, one sheathed battle ship, \$3,593,000; act of March 3, 1899, one unsheathed battle ship, \$3,540,000.

Fore River Ship & Engine Company, Quincy, Mass., act March 3, 1899, one sheathed battle ship, \$3,580,000; two sheathed battle ships, \$3,555,000 each; act March 3, 1899, one unsheathed battle ship, \$3,430,000; two unsheathed battle ships, \$3,405,000 each; act of June 7, 1900, one unsheathed battle ship, \$3,430,000; two unsheathed battle ships, \$3,405,000 each.

New York Ship Building Company, Camden, N. J., act March 3, 1899, one sheathed battle ship, \$4,200,000; two sheathed battle ships, \$4,175,000 each; act March 3, 1899, one unsheathed battle ship, \$4,100,000; two unsheathed battle ships, \$4,075,000.

John H. Dialogue & Sons, Camden, N. J., act March 3, 1899, one sheathed battle ship, \$3,400,000; act March 3, 1899, one unsheathed battle ship, \$3,290,000; act June 7, 1900, one unsheathed battle ship, \$3,290,000.

Bath Iron Works, Bath, Maine, act March 3, 1899, one sheathed battle ship, \$3,590,000.

Union Iron Works, San Francisco, Cal., act June 7, 1900, one unsheathed battle ship, \$3,460,000.

Moran Brothers Company, Seattle, Wash., act March 3, 1899, one sheathed battle ship, \$3,865,000; two sheathed battle ships, \$3,749,000 each; act March 3, 1899, one unsheathed battle ship, \$3,697,000; two unsheathed battle ships, \$3,586,000 each; act June 7, 1900, one unsheathed battle ship, \$3,697,000; two unsheathed battle ships, \$3,586,000 each.

### Cruisers.

William Cramp & Sons Ship & Engine Building Company, Philadelphia, act March 3, 1899, one sheathed cruiser, \$3,890,000; act June 7, 1900, one unsheathed cruiser, \$3,780,000.

Newport News Ship Building & Dry Dock Company, Newport News, Va., act March 3, 1899, one sheathed

cruiser, \$3,885,000; one unsheathed cruiser, \$3,775,000; act June 7, 1900, one unsheathed cruiser, \$3,775,000.

Fore River Ship & Engine Company, Quincy, Mass., act March 3, 1899, one sheathed cruiser, \$3,975,000; two sheathed cruisers, \$3,950,000 each; one unsheathed cruiser, \$3,800,000; two unsheathed cruisers, \$3,775,000 each; act June 7, 1900, one unsheathed cruiser, \$3,800,000; two unsheathed cruisers, \$3,775,000 each.

John H. Dialogue & Sons, Camden, N. J., act March 3, 1899, one unsheathed cruiser, \$3,825,000; act June 7, 1900, one sheathed cruiser, \$3,825,000.

Union Iron Works, San Francisco, Cal., act March 3, 1899, one sheathed cruiser, \$3,800,000; one unsheathed cruiser, \$3,750,000; act June 7, 1900, one unsheathed cruiser, \$3,750,000.

Moran Brothers Company, Seattle, Wash., act March 3, 1899, one sheathed cruiser, \$4,132,000; two sheathed cruisers, \$4,008,000 each; one unsheathed cruiser, \$3,963,000; two unsheathed cruisers, \$3,844,000; act of June 7, 1900, one unsheathed cruiser, \$3,963,000; two unsheathed cruisers, \$3,844,000 each.

Risdon Iron & Locomotive Works, San Francisco, Cal., act June 7, 1900, one unsheathed cruiser, \$4,075,000.

Owing to the variety of plans submitted the figures presented in the proposals do not offer a safe guide as to the probable allotment of contracts and the specifications will require to be carefully examined by a special naval board before the contracts are awarded. The cost limit placed by Congress upon the battle ships is \$4,500,000 each for the sheathed and \$4,000,000 for the unsheathed, and upon the cruisers \$3,600,000 each.

Following is a semiofficial summary of the vessels:

### The Battle Ships.

The five battle ships covered by these proposals include three authorized by the act of March 3, 1899, which were never contracted for, owing to delays in the procurement of armor bids and because of the controversy as to whether quadrilateral or superimposed turrets should be employed in their construction. The other two were provided for by the naval appropriation bill passed at the last session of Congress.

The new ships will be known as the "Pennsylvania," "New Jersey," "Georgia," "Virginia" and "Rhode Island." Three are to be sheathed and coppered and will carry superimposed turrets. The other two are unsheathed vessels, with their small turrets quadrilaterally arranged. Although Congress made certain stipulations as to the sheathing of certain of the battle ships, the Secretary hopes by legislation to be enacted at the present session to secure absolute discretion in this matter, and bidders were therefore invited to submit proposals for both sheathed and unsheathed ships.

The sheathed vessels are to be of 15,000 tons displacement, with a length of 435 feet, breadth of 76 feet 10 inches and greatest draft of 26 feet. The unsheathed ships are slightly smaller, and on the same length are 7½ inches narrower and 400 tons less displacement. Both classes of battle ships will compare with any in the world, not only afloat, but projected, for they will have a speed of at least 19 knots, which is expected to run up to 19½, a great pace for a battle ship, which will be maintained by twin screw engines of 19,000 horse-power, supplied by 24 water tube boilers.

The radical difference in the battle ships to the outward appearance will lie in the turrets. Each ship will carry four 12-inch guns. These are of the extraordinary length of 40 calibers, of the new type just turned out by the Ordnance Bureau, and superior in efficiency to any 12-inch gun in the world, and at least equal to the 13-inch guns which have marked the maximum caliber in the American Navy. In the three sheathed vessels a pair of 8-inch guns will be mounted on the top of each 12-inch turret. Four other 8-inch guns will be distributed in two turrets amidships on these two vessels.

The unsheathed vessels will have all of their eight 8-inch guns mounted in four independent turrets, one placed at each corner of the oblong superstructure. Both classes of vessels, sheathed and unsheathed, will have a broadside of 12 6-inch rapid fire guns on the main deck, besides 12 14-pounders, 12 2-pounders and a number of automatic guns, making a battery more formidable than

any afloat, as far as ability to concentrate fire and throw weight of metal is concerned.

In the matter of defensive power the battle ships of both classes are unsurpassed, carrying an 8-foot wide water line belt of armor 11 inches thick over the vitals of the ship, tapering to 4 inches at the ends. The 6-inch guns will be placed behind the protection of 6 inches solid hardened steel, and the turrets will vary from 10 to 11 inches in thickness. A curved turtle back protective deck and a cofferdam belt all around the water line, stuffed with cellulose, will afford further protection. Electricity will be used in the battle ships to much greater extent than in any other ships afloat, and the use of wood will be restricted to the minimum.

#### The Armored Cruisers.

The six armored cruisers, the "West Virginia," "Nebraska," "California," "Maryland," "Colorado" and "South Dakota," represent the highest development of the naval constructor's art, for Chief Constructor Hichborn has not only managed to design in them ships as fleet as any foreign navy can boast, but has endowed them with the qualities of battle ships at many points. Three of these ships are to be sheathed and three are to be unsheathed. Of a less displacement than the battle ships, 13,000 tons in the case of the sheathed and 13,400 in the case of the unsheathed cruisers, these vessels are still considerably longer, being 502 feet on the water line, with a breadth of 70 feet and a draft of 26 feet 6 inches. Quadruple twin screw engines of 23,000 horse-power, supplied by 30 boilers, will propel these great ships at a minimum speed of 22 knots per hour, and with capacities for 2000 tons of coal in their bunkers their endurance will surpass that of any similar foreign vessels. Each cruiser will carry four 8-inch guns in Hichborn balanced turrets, four 6-inch guns in sponsons at each corner of the superstructure and ten 6-inch broadside guns, besides the usual secondary battery. Six inches of hardened steel will extend in a belt around the ships, 7 feet 6 inches broad, and the guns in the citadel and superstructure are proportionately protected. A heavy protective deck and cofferdam belt complete the protection.

W. L. C.

## Canadian News.

### Dispute Over the Helen Mine.

TORONTO, December 7, 1900.—The Ontario Cabinet was in council for some hours on Thursday listening to arguments relative to the ownership of part of the famous Helen iron mine. There is a dispute as to where the boundary line of that Michipicoton property falls. The dispute is a long pending one. The land in question is claimed by the Clergue interests on the one hand and by Mr. Ely, a mining capitalist of Minneapolis. Both parties were represented by eminent counsel before the Government, which is acting as arbitrator in the matter. The legality of an alleged ruling given by one of the Government's mining inspectors is involved, as is also the correctness of the plan made by the official surveyors. The ruling alleged was, it seems, made in favor of Mr. Ely. Mr. Clergue claims that he and his associates have expended at least half a million dollars in working the property, and contends that the mining inspector had no jurisdiction to give a ruling on the question. The Commissioner of Crown Lands has had the matter before him for some time. After the hearing of the arguments by the full cabinet on Thursday judgment was reserved.

### The Ferromanganese Project.

Since last writing considerable progress has been made by the Mineral Products Company in the matter of securing a site and other advantages for the establishing of a ferromanganese smelter. First the representatives of the company—Russell P. Hoyt and Fritz Gleim—met the Mayor of St. John and a committee of the City Council, and laid before them the following representations and arguments:

"The company have secured deposits situated in the counties of Albert, Kings, Westmorland and Gloucester, of both bog (wad) and hard (rock) ore, sufficient to carry

on operations for many years, and are provided with ample capital for this purpose.

"The company will require for their operations the following:

"A tract of land of some 8 or 10 acres, in convenient location to railway and water front. The latter being accessible to vessels of large draft, having, say, 20 feet of water at low tide.

"We will require, say, 50,000 gallons per hour of water for cooling, condensing and steam purposes, of which supply the water used for steam generation should be drawn from the city water supply.

"The furnace to be erected will use from 4000 to 5000 tons of coke per month, which will be drawn either from the United States, or, if possible, from Canadian manufacturers; some 5000 tons of ore from the company's mines in the provinces, and say 1000 tons of limestone, besides other fuel, &c., supplies. The output of the works will be from 2000 to 4000 tons of metal per month, which will be shipped to the steel makers in Canada and foreign countries. There will be also some 5000 tons of slag to be disposed of, which may find useful quarters in the making of land, the ballasting of railroads, the improvement of streets or even the manufacture of cement. In all the operation of this plant may involve the handling of some 20,000 tons of raw materials and product per month, or say some 250,000 tons per annum in immediate connection with the operation of this blast furnace.

"If it should be decided to concentrate our present clinkering operations and future blast furnace operations, a considerable amount of the above materials would have to be handled a second time, involving additional labor."

In the afternoon of the same day—the 3d inst.—the full City Council met and appointed a sub-committee to prepare and propose terms on which the Council should deal with the company. The sub-committee lost no time in proceeding to business. A hearing was granted to Messrs. Helm and Hoyt. Mr. Gleim said that the company had for the last three years been developing manganese properties in the Maritime Provinces, particularly in Albert County, N. B., near Hillsboro. He explained the nature of the mineral deposits. As they rest in the bog they are absolutely useless, for water and vegetable matter comprise 75 per cent. of the deposit. These elements are separated and the residuum is utilized. The water is driven off by evaporation, and the powder that remains is made into bricks for easy handling. The company had a blast furnace in Nova Scotia, where many tons of the ore were converted into ferromanganese. But the plant was not near a railway or waterway, and at the expiration of the lease operations there were dropped, the company confining themselves to mining work. As the result of experiments a more economical process for eliminating water and vegetable matter was discovered, and the company succeeded in clinkering the ore. On the success of these improvements the company are venturing on the project they are now discussing with St. John. Mr. Gleim went on to say that there are many thousands of acres of these wad ores, besides which the company own large areas of hard manganese ore. But the bulk of the material will be furnished by the wad deposits, which will have to be made into clinker form in order to treat it with the greatest advantage. Mr. Gleim added that, in company with the City Engineer, he and Mr. Hoyt had looked over many sites in St. John, and concluded that there was but one suitable, which he designated.

In the discussion which followed other details were added by Mr. Gleim. He said the output would be 75 tons a day, that from 125 to 225 men would be employed at the smelter and at the deposits, that salt water would do for cooling purposes, but that city water would be required for steam, that the initial cost of the plant would be between \$250,000 and \$500,000, and that a year would be required to get the works ready.

Mr. Hoyt's remarks related chiefly to freight rates. Railway rates would be prohibitory, he declared, quoting existing rates as the basis for this statement. Consequently a site was desired at which the ore could be laid down from vessels. After Mr. Gleim and Mr. Hoyt



withdrew the sub-committee passed the following resolution:

"Resolved, That a renewable lease for 21 years at a nominal rental of \$1 a year be given the Mineral Products Company, and that during the original term they be exempted from all taxes and supplied free of charge with water for steam generation purposes, conditioned upon the company establishing and operating continuously a blast furnace plant for the production of ferromanganese; said lease to contain agreements as to initial cost of establishment of plant, as to time of commencing construction and beginning operations of plant, and as to use and disposal of slag and other refuse; the property to include the lots owned by the city and not leased to tenants, lying between the Barracks line, so-called, and St. James street and to the eastward of Pitt street and westward of the railway track; also a tract of 10 acres to the eastward of the railway track."

This means a 10-acre lot jutting out into Courtenay Bay, and about 1 acre of the shore properties.

#### **Dominion Iron and Steel Company.**

There was a meeting of the Dominion Iron & Steel Company on the 28th ult. at their offices in Montreal. President Whitney was in the chair. Besides him there were in attendance A. J. Moxham, general manager and vice-president; James Ross, R. B. Angus, H. F. Dimock, Elias Rogers, B. F. Pearson and Senator David McKeen. Routine business was transacted. The reports submitted were satisfactory. A hundred coke ovens are completed and 300 more are to be finished by next April. Two of the four blast furnaces are ready for operations. These facts were brought out in the course of an interview with Mr. Moxham in the *Montreal Gazette*. He said the company would be making pig iron soon. The steel plant will be ready by next August, and the output will be from 800 to 1000 tons a day. Plans, he says, are on foot for the manufacture of billets, and the problem is before the company as to the most available finished condition that the steel should be brought to. In that interview Mr. Moxham remarked that one difference between conditions in the United States and at Sydney was this—that in the latter country the whole steel business is based on a summer supply of ore, whereas at Sydney it is possible to carry on operations with but a very small stoppage in the oil-year-round deliveries of ore. For the past 20 years the average closing of Sydney Harbor has not exceeded 39 days per annum. By the close of navigation, Mr. Moxham added, the company will have 175,000 tons of ore on hand, and will require from 2400 to 3000 tons per day. After repeating that the company would be operating at full blast next mid-summer, Mr. Moxham continued as follows:

"It undoubtedly means cheaper pig iron and cheaper steel for every Canadian consumer, and should correspondingly enlarge the market of the consumer. Canada is to-day, for instance, a large importer of pig metal. The Dominion Steel Company will make more pig metal than the amount consumed in Canada; hence, the basis in the past that has given the price to pig metal has been the American market, plus the duty. The basis of the future price will be the export market. We will, of course, get what we can from the Canadian consumer, but we are powerless to run away from the economic law which governs the situation. We have had nine boats carrying the ore, but our future fleet will be uncertain, as the question is governed as much by the points to which we ship as by the tonnage we export."

To the *Montreal Herald* Mr. Moxham also gave an interview concerning the rumor that North Sydney was to be an ocean port of some of the steamship lines. He expressed the opinion that the manufacture of steel ships in Nova Scotia would shortly follow the manufacture of steel rails.

#### **Steel Ships in Maritime Provinces.**

Hon. William Pugsley, Attorney-General of New Brunswick, made the statement a few days ago that his Government had official notice of the formation of a company to carry on steel shipbuilding operations at St. John and Halifax. As yet no formal proposal has been made to the Government to assist the enterprise, but

parties interested have discussed the matter with both the Premier and Mr. Pugsley, and have learned that any proposals they submit will receive consideration.

#### **New Industries for Ottawa.**

The new power house of the Capital Power Company was formally opened on the 1st inst. It is situated at Deschenes Rapids, 5 or 6 miles from Ottawa on the Ottawa River. The power is all contracted for to manufacturing factories in Hull and Ottawa. The equipment is for the production of upward of 3000 horse-power. There will be 11 turbines and 2 generators when the instalment is complete. The plant was furnished and put in place by the Canadian General Electric Company of Peterborough.

Large bridge and structural iron works are likely to be established at Ottawa during the next year. A party of Ottawa and Montreal capitalists have secured options for the purchase of a site for such works. While there is a great deal of bridge work in Eastern Ontario there is no manufacturing industry of the kind in that part of the Province. The site selected is said to be well suited for the purpose.

Powers & Co., Ottawa, are manufacturing a specimen of a mechanism for condensing and saving steam. It is known as Keller's new feed water heater, purifier, condenser and hot air blast device. A few days ago it was brought to Ottawa by J. M. Keller of Springfield, Mass. Having received an order from the E. B. Eddy Company, Mr. Keller is having one of the machines made by Powers & Co. He is taking steps to organize a company to manufacture the article on a large scale in Ottawa.

#### **Minor Notes.**

The poles for a telegraph line have been distributed along the route of the Algoma Central Railway. When this line is completed, Michipicoton, which is now two days' travel from the nearest point of communication, will be brought into connection with the outside world.

Another writ has been issued on behalf of Dr. Carl Hoepfner. This one is against the Nickel Copper Company, as well as against the Hoepfner Refining Company, to prevent the latter corporation from transferring and leasing their property and plant to the former.

The officials of the Bureau of Mines state that the Canada Corundum Company are opening up their properties in the counties of Hastings and Renfrew, and will shortly have graded and crushed corundum on the market.

A working plant is being installed on the Cryderman Mine in the township of Garson, 7 miles northeast of Sudbury, by the Mond Nickel Company.

The Canadian Copper Company have nine furnaces running now, treating 700 tons of ore every 24 hours.

C. A. C. J.

**The Columbus Iron & Steel Company.**—At a meeting of the stockholders of the Columbus Iron & Steel Company at Columbus, Ohio, November 30, the following officers were elected: Col. H. A. Marting, president and treasurer; Col. J. G. Battelle, first vice-president; F. H. Miller, second vice-president and general manager; Walter W. Marting, secretary. The capital stock of the company was increased to \$500,000 all paid, the increase being practically all subscribed by the original stockholders. The Columbus Iron & Steel Company have two furnaces located in South Columbus, with the best of railroad facilities for receiving raw material and distributing pig iron throughout Ohio and the Central West. This plant, which has hitherto been described in our columns, is strictly up to date for the production of merchant pig iron. One stack is now in most successful operation on foundry iron and the second stack will be ready for operation in January next. The principal officers and stockholders of this company are men of successful experience in the iron and steel industry. Under their guidance the most careful attention is given to grading and prompt service.

M. R. Muckle, Jr., & Co., the Philadelphia representatives of Westinghouse Church, Kerr & Co., have removed to their new office, 512 Stephen Girard Building, 21 South Twelfth street, Philadelphia, Pa.

## Hardness, or the Workability of Metals.\*

BY W. J. KEEP, DETROIT, MICH

A test of the workability of a metal will not distinguish between hardness, which blunts a tool, and tenacity, which makes it difficult for a tool to remove a portion of the material. A punch pressed into the surface of a metal is hindered by both these properties.

Prof. Thomas Turner constructed a machine which indicated hardness by the scratch of a standard octahedral diamond across a polished surface. Gram weights were placed on the diamond until a scratch could just be seen as a dark line on a bright surface. The number of grams was the degree of hardness. This is the most practical test for metals too hard to be cut with a drill, such as chilled and white cast iron.

In 1897 Chas. A. Bauer, unaware of any former experiments along this line, arranged an ordinary drill press as a test of hardness. He used a hand made flat  $\frac{3}{8}$ -inch drill, with 160 pounds pressure, with a speed of 250 revolutions per minute. A revolution counter records the number of revolutions of the drill required to penetrate a test bar exactly  $\frac{1}{2}$  inch after the lips are under the surface. This apparatus has been in constant use since that date, and is a practical success. Fig. 1 shows this machine. I arranged with Mr. Bauer to make such machines for the market, using an autographic diagram for a record instead of the number of revolutions.

When I had constructed a machine, I found that with an ordinary drill press the varying friction of the working parts influenced the diagram. With a drill penetrating the top of a test bar, the hot chips remaining in contact with the drill drew the temper of the extreme edge. A horizontal machine developed more defects than the vertical form.

After repeated failures, I placed all of the working parts below the table, making the drill enter the under side of the test specimen, and not giving the drill any vertical motion. Fig. 2 shows this machine. A table with a vertical motion has the test bar clamped on its upper surface over a  $\frac{1}{2}$ -inch central opening, which receives the point of the drill. Four rods attached to this table pass downward, and are attached to an iron weight near the floor. Loose weights, from  $\frac{1}{2}$  pound to 10 pounds—50 pounds in all—are added, making the whole load on the drill point 150 pounds. The test specimen is weighed and an equal amount of removable weight is taken off.

The downward movement of the specimen is transferred by a steel ribbon to an arm moving on ball bearings, the end of which carries a recording pencil, which multiplies the record five times. To allow this pencil to act directly on the paper a table is provided, with a curvature equal to the path of the pencil, and which is moved at right angles to the mark made by the pencil by means of a screw driven by a worm on the drill spindle. One hundred revolutions of the drill move the paper 1 inch; 1-5 inch penetration moves the pencil 1 inch.

### Scale of Hardness.

As the diagram will be of a diagonal between 90 degrees, and the base line described by the pencil before the drill moves, with an ordinary transparent protractor, the angle that the diagram makes with the base line is the degree of hardness; 90 degrees, the limit of the machine, is the hardness of any material that the drill cannot penetrate.

The speed of the drill is 200 revolutions per minute, to prevent heating under all conditions. A variation of speed does not materially vary the diagram.

Table I.				
Number revolutions of drill.	100	200	300	400
	Deg.	Deg.	Deg.	Deg.
First test.....	45.1	44.6	43.9	43
Second test.....	29.1	30	29	28.6
Third test.....	27.9	27	28.4	...

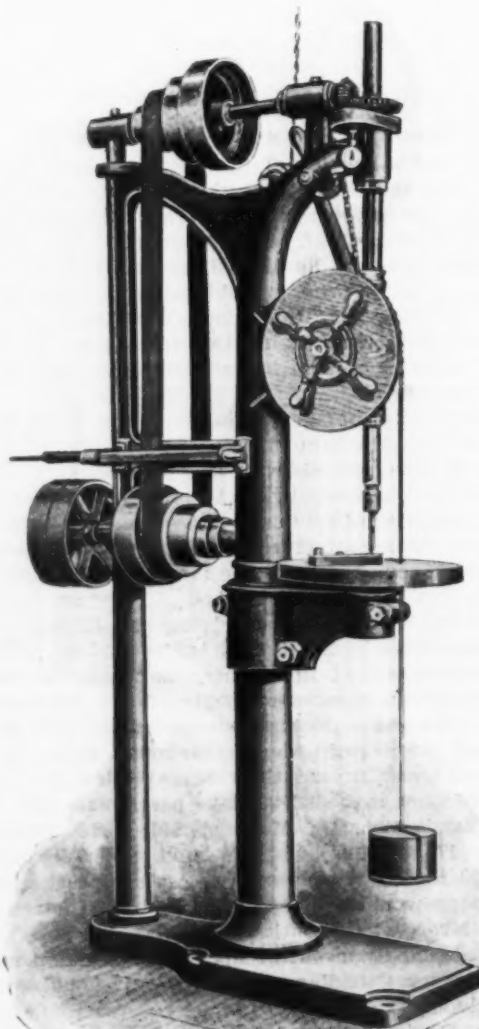
The specimen and its weight hang on the point of the drill practically without friction. They move so freely that it is necessary to apply a slight friction to the ball bearing to prevent a vibration of the pencil point.

\* Paper presented at the New York meeting of the American Society of Mechanical Engineers.

A variation of load would materially influence the diagram. One hundred pounds gave 45 degrees; 125 pounds, 38.4 degrees, and 150 pounds, 32.9 degrees. A trip is set to stop the drill at any desired depth of hole. The machine is started by a clutch. By a pinion and rack, that is disconnected while drilling, the table with specimen is raised or lowered at will by a hand wheel at the upper part of the machine, with friction applied to its rim, that will support the 150-pound load.

### Drills.

I found that a straight, fluted drill made a better diagram than a twist drill, and would wear better. The Cleveland Twist Drill Company guarantee to make drills for this purpose of uniform temper and shape. I grind



Drill Arranged for Test of Hardness.

## HARDNESS, OR THE WORKABILITY OF METALS.

the heel of the drill away, so as to leave the lips 1-16 inch thick and the shape of an ordinary flat drill. The straightway drill gave 25 degrees and the twist drill 29 degrees, but probably the difference in clearance would cause this. The straightway drill ground to 10 degrees gave 77 degrees; given a very little clearance, but the heel still touching, gave 59 degrees; with heel ground away like a flat drill, gave 30 degrees.

### Grinding.

I found that a dry wheel would draw the temper from the extreme cutting edge, and that the ordinary grinders would not make each lip cut alike. I therefore made the very simple wet grinder shown in Fig. 3. The angles of the drill are those recommended by the drill makers, and in using the machine all drills are to be ground on this grinder. The grinding does not, however,



make very much difference. Drill sharpened by grinder, all angles exactly alike, and both lips taking the same chip, gave 30 degrees; drill sharpened by hand, 31 degrees, and ground so that only one lip cut, gave 30.8 degrees.

#### Entering the Drill.

If the drill is started on a flat surface it enters more rapidly at first, making the first part of the diagram a curve, showing the hardness of the skin of the casting, or else the influence of the scale on the lips of the drill. The test bar may be pickled to remove the scale, but in any case the cutting edges will be blunted by the grit

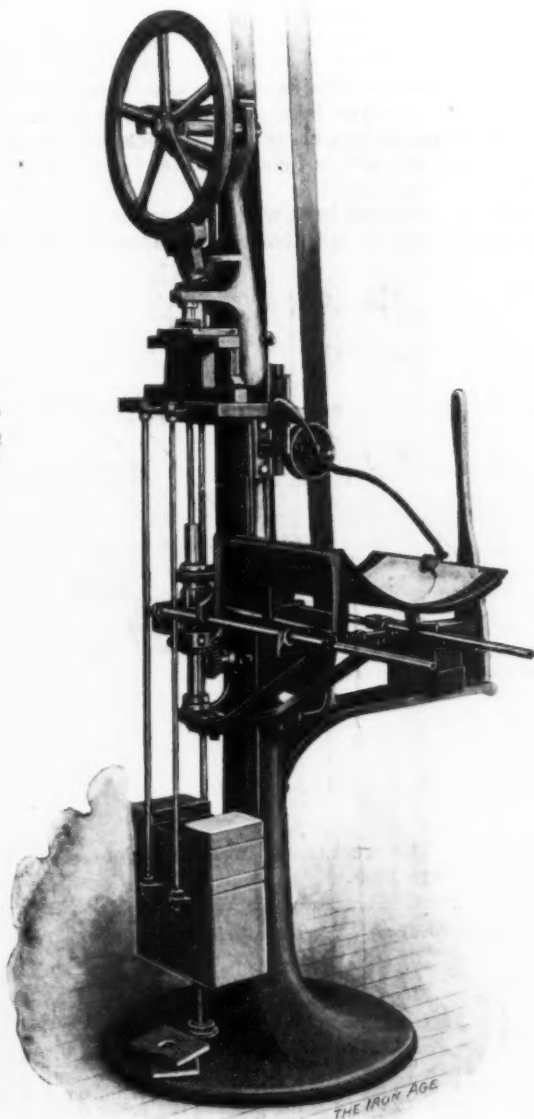


Fig. 2.—The Keep Machine for Testing Hardness.

#### HARDNESS, OR THE WORKABILITY OF METALS.

in the surface. Entering through the ordinary sand scale of a 1 inch square cast iron test bar, the drill gave a diagram clear through the bar of 39 degrees; but the same drill resharpened, and in a hole alongside with the scale ground off, gave 32.5 degrees. I therefore countersink with a  $\frac{1}{2}$ -inch drill until the lips are nearly into the surface. Entering, the test drill in this countersink begins with a full cut, and shows the hardness of the metal uninfluenced by local and varying conditions. (I use the term "hardness" when I mean workability of the metal, or abrasive resistance.)

For experimental work, as for this paper, the drill is ground after drilling each hole; but if the surface is first removed, for shop use this is not necessary. The following records were made by drilling holes in the same

bar in succession  $\frac{1}{2}$  inch deep without resharpening; the surface was ground clean: 25.6, 25.5, 25.8, 26.5, 25, 25, 26.8, 26, 27, 27.5, 26.9, 27, 27, 27.2, 27, 26.3, 26.8, 25.6, 27, 25.5 degrees, the last being the same as the first. The same bar, with the drill sharpened after each hole, gave 27.6, 26.5, 26.2, 25.5, 26.2, 26.5 degrees. In another bar of another iron, sharpened each time, holes near together, gave 28.5, 28.2, 30.8 degrees.

Spongy spots in castings, though called sand holes, usually do not contain grit and do not injure the drill; as soon as sound metal is again reached the original diagram is resumed.

#### Diagram.

Fig. 4 shows a diagram from a bar  $\frac{1}{2}$  inch square and another diagram from a hole alongside, where the metal was all sound. The first diagram is from a bar containing hard spots and soft spots. The drill strikes a hard spot that it cannot cut, even after regrinding. When the metal is nearly too hard to cut the edge becomes dulled. In a sample of almost white iron the drill penetrated 3-16 inch at 61 degrees, then 90 degrees, resharpened and in the same hole 1-5 inch at 61.5 degrees, then 90 degrees, sharpened again 1-25 inch at 82 degrees, then 90 degrees, again sharpened 2-5 inch at 62.8 degrees, then 90 degrees.

In a test bar of series 1, Iroquois,  $\frac{1}{2}$  inch square (the first diagram in Fig. 4 is another hole in this bar), near the ends there were no hard spots, but near the center the fracture was full of white spots. The drill entered 58.5 degrees; at 1-20 inch deep struck a hard spot, about 1-40 inch thick, 84 degrees; then for 1-5 inch soft, 49.1 degrees; then hard, 65 degrees.

Another hole alongside, 1-10 inch deep, at 51 degrees, then 90 degrees, resharpened and in same hole 63 degrees, then 74 degrees, then 82 degrees, then a soft spot, 64 degrees; then 75.2 degrees, then 90 degrees, resharpened and 90 degrees, would not penetrate further, and hole only 2-5 inch deep. A soft metal, on account of its toughness, will sometimes give a larger record than a harder metal. A test bar from tea chest lead gave 4 degrees, because the metal was simply crowded into the flutes of the drill, but block tin gave clean chips and was 1.1 degrees with 150 pounds on the drill, and 2 degrees with 100 pounds. An alloy of 90 parts aluminum and 10 parts tin gave 10.5 degrees with 150 pounds, and 16 degrees with 100 pounds. A test bar of soft copper gave 47 degrees, while a bronze, with 90 per cent. copper and 10 per cent. aluminum, gave 21 degrees, and a bronze with 9 per cent. aluminum gave 23.8 degrees, though it was softer than the 10 per cent. metal. The copper was soft, but tough. A bar of Jessup's steel gave nearly the same diagram as purchased and after annealing in lime.

A rolled bar of puddled iron gave 63 degrees; a cast bar of Bessemer steel (with no manganese), 73 degrees; a bar from grain nickel, 77 degrees.

Three sets of  $\frac{1}{2}$  inch square test bars were made at three different times—one bar in dry sand molds; one bar in sand as ordinarily moistened for green sand molding, and the third bar in sand so wet that water would run out.

Table II.

	First set. Deg.	Second set. Deg.	Third set. Deg.
Dry sand.....	25	28	29.5
Ordinary sand.....	26	30	29
Very wet sand.....	29	29	33

#### Drillings for Chemical Analysis.

This machine is especially made for this purpose. A tray slides under the table, and the drill passes through a revolving disk between the tray and the under side of the table, having a rubber packing around the drill. Around the whole on the upper surface of the table is a gutter to catch any dirt or sand, and the raised edge around the hole makes a close joint with the test bar, the under surface of which is free from sand on account of the countersink. The disk revolving with the drill catches all the drillings and throws them to the sides of the tray, mixing them thoroughly, and all particles of dust are saved. The tray fits dust tight under the table. When these drillings are placed in a marked envelope they are free from all outside matter and should be used as a whole and no parts selected with a magnet. Chemical analysis would interpret the hardness diagrams.

Everything about the machine being practically invariable, except the hardness of the test piece, the size of the drillings will vary with the hardness, and therefore there will be a standard of uniformity that is most desirable. For laboratories not having power the machine is driven by hand.

#### Hardness and Chemical Composition.

According to general opinion, all of the chemical elements found in cast iron harden it. Carbon and manganese certainly do. Sulphur causes the carbon to be combined and thus hardens. Phosphorus does not influence carbon, but hardens. Silicon hardens cast iron, but it causes carbon to change from the combined state into graphite and thus becomes a softener. A white iron that cannot be cut, by an addition of silicon becomes mottled or gray and can be cut. Hard iron softened by changing combined carbon, becomes tough as it becomes soft, and in a test of workability this modifies the record, which otherwise might show the influence of chemical composition.

Tables III and V show the record of shrinkage and the records of hardness of each size of test bar made in 1894 for the society's committee on methods of testing. The sizes were  $\frac{1}{2}$  inch square, 1 inch square, 2 x 1 inch, 2 inches square, 3 inches square and 4 inches

27 degrees. In one bar from heavy machinery iron, 2 x 1 inch, three holes 1 inch apart were 32.2, 33.2, 32.3 degrees, but in a bar from series 17, 3 inches square, one hole gave 44 degrees, and  $1\frac{1}{4}$  inches distant the drill would not cut at all. I have already shown that near the ends of a  $\frac{1}{2}$  inch square bar of series 1 the iron was soft, and near the center the bar was full of hard spots.

Table IV.—Hardness—Series D and E, A. F. A. Tests.

Series.	Kind of mold.	$\frac{1}{2}$ in. sq. $\times$ 12 ins.	$\frac{1}{2}$ in. sq. $\times$ 12 ins.	$1\frac{1}{2}$ ins. sq. $\times$ 12 ins.	$2$ ins. sq. $\times$ 12 ins.	$2\frac{1}{2}$ ins. sq. $\times$ 12 ins.	$3$ ins. sq. $\times$ 12 ins.	$3\frac{1}{2}$ ins. sq. $\times$ 12 ins.	$4$ ins. sq. $\times$ 12 ins.
D, Chill Roll	Green sand	90°	90°	90°	39°	35°	38°	30°	33°
	Dry sand..	90°	90°	90°	39°	33°	37°	36°	36°
E, Sand Roll	Green sand	90°	90°	90°	61°	38°	33°	36°	33°
	Dry sand..	90°	90°	90°	55°	36°	40°	37°	31°

A hardness diagram shows exactly the character of the metal taken from the hole. In one  $\frac{1}{2}$  inch square bar a spiral hard spot was encountered which did not make an irregular diagram, but could be seen on the walls of the hole.

Each of these test bars was analyzed in triplicate in 1894 by Dickman & Mackenzie, 1224 Rookery Building,

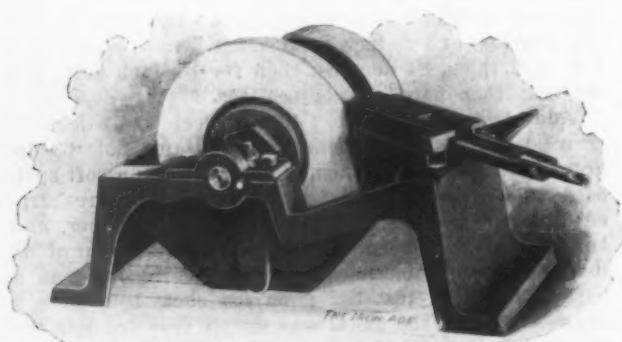


Fig. 3—Grinding Drill.

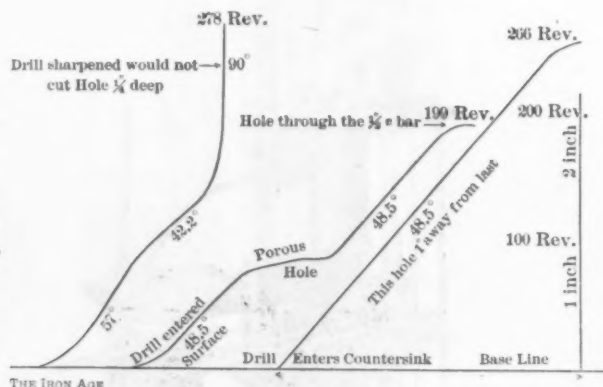


Fig. 4.—Diagram.

#### HARDNESS, OR THE WORKABILITY OF METALS.

square. There were 19 series of these bars. It was intended to vary the silicon in series 1 to 6 and 7 to 12 to give 1, 1.50, 2, 2.50, 3 and 3.50 per cent. The other seven series were from various foundries and their ordinary

Chicago, Ill. The records are in Transactions, 1895, beginning on page 1099.

Table III.—Hardness—Nineteen Series, A. S. M. E. Tests.

Kind of iron.	Calculated silicon.	Number of series.	$\frac{1}{2}$ in. sq. $\times$ 12 ins.	$1$ in. sq. $\times$ 24 ins.	$2$ ins. $\times$ 1 in. $\times$ 24 ins.	$2$ ins. sq. $\times$ 24 ins.	$3$ ins. sq. $\times$ 24 ins.	$4$ ins. sq. $\times$ 24 ins.
Iroquois with silicon added by Pencost ferro-silicon .....	1.00	1	58°	41°	34°	28°	28°	27°
	1.50	2	34°	30°	37°	32°	28°	28°
	2.00	3	33°	31°	32°	27°	27°	20°
	2.50	4	36°	32°	30°	30°	20°	25°
	3.00	5	31°	29°	26°	27°	24°	35°
	3.50	6	33°	33°	32°	21°	30°	28°
Hinkle and Pencost .....	1.00	7	62°	28°	30°	25°	30°	26°
	1.50	8	29°	32°	30°	33°	24°	27°
	2.00	9	30°	23°	31°	32°	28°	30°
	2.50	10	31°	31°	28°	30°	30°	33°
	3.00	11	32°	27°	22°	19°	22°	22°
	3.50	12	24°	19°	24°	19°	23°	21°
Actual Average.								
Michigan Stove Company .....	2.82	14	35°	28°	25°	23°	24°	38°
	3.18	13	34°	23°	25°	19°	27°	37°
	3.50	15	29°	26°	25°	23°	28°	33°
Car wheel iron....	0.77	19	90°	41°	37°	36°	32°	30°
Light machinery...	1.76	16	38°	37°	34°	38°	24°	27°
Heavy machinery...	2.06	18	45°	33°	32°	31°	28°	28°
Air furnace for malleable iron.....	0.89	17	90°	90°	90°	90°	44°	39°

mixtures. The holes for hardness were made alongside those from which drillings for analysis were originally taken. Gray cast iron suitable for machinery castings is usually uniform in hardness throughout a test bar. The 20 holes drilled 1 inch apart along a test bar 24 inches long and 1 inch square varied only 2 points in

Table V.—Shrinkage—Nineteen Series, A. S. M. E. Tests.

Kind of iron.	Average per cent. silicon.	Number of series.	$\frac{1}{2}$ in. sq.	$1$ in. sq.	$2$ ins. $\times$ 1 in.	$2$ ins. sq.	$3$ ins. sq.	$4$ ins. sq.
Iroquois, with silicon added by Pencost ferro-silicon .....	0.80	1	0.133	0.160	0.148	0.131	0.116	0.102
	1.21	2	0.172	0.150	0.138	0.125	0.110	0.106
	1.88	3	0.166	0.145	0.130	0.109	0.069	0.039
	2.01	4	0.162	0.143	0.123	0.099	0.066	0.128
	3.19	5	0.157	0.105	0.094	0.075	0.067	0.057
	3.04	6	0.161	0.130	0.086	0.077	0.085	0.033
Hinkle and Pencost .....	0.93	7	0.176	0.149	0.144	0.139	0.115	0.072
	1.17	8	0.160	0.145	0.126	0.122	0.098	0.092
	1.67	9	0.156	0.141	0.134	0.128	0.083	0.036
	2.23	10	0.154	0.124	0.092	0.094	0.075	0.067
	2.71	11	0.157	0.102	0.090	0.062	0.053	0.023
	3.50	12	0.144	0.098	0.092	0.068	0.048	0.023
	2.82	14	0.148	0.098	0.083	0.072	0.063	0.035
Michigan Stove Company .....	3.18	13	0.130	0.095	0.091	0.079	0.072	0.052
	3.50	15	0.123	0.094	0.096	0.091	0.078	0.032
Car wheel iron....	0.77	19	0.238	0.153	0.142	0.144	0.126	0.115
Light machinery...	1.76	16	0.171	0.151	0.143	0.129	0.100	0.069
Heavy machinery...	2.06	18	0.161	0.139	0.120	0.091	0.067	0.042
Air furnace for malleable iron.....	0.89	17	0.248	0.247	0.221	0.201	0.157	0.144

Table VI.—Shrinkage—Series D and E, A. F. A. Tests.

Series.	Shrinkage, Dry sand bars.	$\frac{1}{2}$ in. sq.	$1$ in. sq.	$1\frac{1}{2}$ ins. sq.	$2$ ins. sq.	$2\frac{1}{2}$ ins. sq.	$3$ ins. sq.	$3\frac{1}{2}$ ins. sq.	$4$ ins. sq.
D { Aver. sil- icon, 0.085 Dry sand. }		0.280	0.270	0.220	0.160	0.140	0.140	0.130	0.110
E { Aver. sil- icon, 0.072 Dry sand. }		0.230	0.180	0.170	0.160	0.150	0.140	0.130	0.110

Table IV gives the hardness of Series D and E, chill roll iron and sand roll iron, made for the Testing Com-



mittee of the American Foundrymen's Association, of which Dr. Richard G. G. Moldenke is chairman.

Tables V and VI give the shrinkage of the same test bars, which indicates the influence of silicon in each of the bars in presence of the influence exerted by each of the other chemical elements in the iron, and the influence of slower cooling as the test bars increase in size.

Series 17 and Series D are very similar, both being from iron refined in an air furnace. Irons high in combined carbon are liable to have soft and hard spots near together, and in these and such series as 19, 1 and 7 the analysis of drillings taken from a single hole may not represent the average metal. Therefore, as the hole for hardness is not the same hole for analysis, some allowance should be made for variation in composition. The variation in shrinkage, which is a mechanical analysis of the influence of all elements and conditions, shows that outside of chemical composition unknown conditions influence the physical quality of cast iron. The same or other conditions may influence hardness.

nese in this case produced the hardness. The 11 per cent. ferrosilicon (Pencost) was very deficient in carbon. The 10 per cent. phosphide of iron contained no carbon, and therefore reduced TC still more, while the 86 per cent. Fe.Mn. contained 6 per cent. carbon.

Table VIII is a record of test bars 1/2 inch square by 12 inches long, made in a crucible from pigs of iron which contained the holes from which the drillings for analysis were taken. The chemical composition would be changed by remelting in a crucible and cooling in a green sand mold of test bars 1/2 inch square.

These results, taken as a whole, and especially those of increasing silicon by crucible heat, suggest that each car of pig iron should be tested for hardness. A mixture can be made that will give soft castings. They seem to indicate that a car of iron may have what would be considered an ideal chemical composition, but that a hardness has been imparted to it during manufacture that is imparted to the casting.

Special care needs to be taken to procure silicon car-

Table VII.—Influence of Annealing Ordinary Gray Cast Iron.

	Shrinkage.		Chill.	Strength.		Hardness.		Analysis by Dickman & Mackenzie.						
	1/2 inch square.	1 x 1 1/2		1/2 inch square.	Dead load.	One end 1/2 inch square.	Other end 1/2 inch square.	Total carbon.	Graphitic carbon.	Combined carbon.	Silicon.	Phosphorus.	Sulphur.	Manganese.
No. 1 bar not annealed.....	0.155	0.169 <sup>2</sup>	0.14	435	0.28	30 8°	28 5°	3.77	3.32	0.45	1.78	0.505	0.041	0.568
No. 3 bar not annealed.....	0.154 <sup>2</sup>	0.172 <sup>2</sup>	0.14	415	0.27	31°	29°							
Average.....	0.156	0.171	0.14	425	0.27 <sup>2</sup>	29.9°								
No. 2 bar before annealing.....	0.157	0.166 <sup>2</sup>	0.14											
No. 4 bar before annealing.....	0.155	0.169	0.14											
Average.....	0.156	0.167	0.14											
No. 2 bar after annealing.....	0.096	0.069	0.06	400	0.36	19°	18.9°	3.77	3.68	0.05	1.78	0.510	0.043	0.568
No. 3 bar after annealing.....	0.095 <sup>2</sup>	0.070	0.08	400	0.34	19°	19°							
Average.....	0.096	0.069 <sup>2</sup>	0.07	400	0.35	19°								

Table VIII.

	Dead load.		Shrinkage.	Chill.	Hardness.	Total carbon.	Graphite.	Combined carbon.	Silicon.	Phosphorus	Manganese.
	Strength.	Deflection.									
Ensley gray forge.....	368	0.20	0.185	0.25	0.48	3.14	2.21	0.98	2.62	0.88	0.16
Summerlee, No. 1 foundry.....	377	0.17	0.165	0.65	0.33	3.38	2.92	0.46	2.00	1.25	1.67
Tuscarawas, No. 2 foundry.....	418	0.34	0.154	0.30	0.33	3.52	3.18	0.45	1.93	0.70	0.86
Napier, No. 3 foundry.....	423	0.19	0.165	0.80	0.37	3.65	3.50	0.15	1.76	0.85	0.48
Eureka, No. 3 foundry.....	443	0.35	0.159	0.45	0.37	3.45	2.90	0.55	1.54	0.83	0.23
Asheand, No. 3 foundry.....	352	0.15	0.136	0.50	0.56	3.83	3.12	0.21	4.70	1.54	0.96

Hardness seems to follow combined carbon very closely, but seems to be modified by other elements or conditions. And it is a question whether toughness does not increase the records from the gray bars. This sensitive machine makes it possible to study the workability of metals in relation to chemical composition.

Before closing I will give a few more examples.

The bars were packed in wood shavings in an iron box, heated to a white heat in 12 hours, and allowed to cool for 24 hours. Reducing combined carbon to four-fifths has reduced hardness one-half. I took a pig of Iroquois, and in a crucible furnace added silicon by the same Pencost as in Series 1 to 6 (which were melted in a cupola). The results were: 1 per cent. silicon, 30 degrees; 1.50 per cent. silicon, 32 degrees; 2 silicon, 34 degrees; 2.50 silicon, 36 degrees; 3 silicon, 33 degrees; 3.50 silicon, 24 degrees. Adding to same Iroquois phosphide of iron, 1 per cent., 35 degrees; adding 86 per cent. ferromanganese, 1 Mn., 34 degrees.

This shows that the hardness of the ferrosilicon, or ferromanganese, or phosphide, is added to the iron, and not necessarily that the silicon, phosphorus and manga-

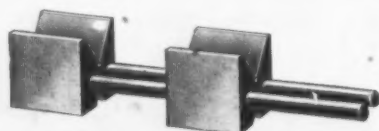
riers which shall be soft in the pig. It is a question whether the close and sometimes uneven grain which much of the pig iron sold on analysis shows will not prove to be hard iron. As a test of pig iron can be made in 15 minutes before a car is unloaded, without any test bars, perhaps pig iron may be sold on a guaranteed hardness. A broad field for inquiry is presented.

**The Simplex Time Recorder.**—Simplex Time Recorder Company, Gardner, Mass., have succeeded to the time recorder department of Heywood Bros. & Wakefield and will continue to manufacture at Gardner, with a Western office at 272 Wabash avenue, Chicago, Ill. The Simplex time recorder is a device for the recording of the working time of employees on arrival and departure from work. Each employee merely pushes a button bearing his number. The time of coming and going is thereby recorded by a series of indelible perforations in a time sheet within the recorder. This time sheet is wrapped about a vertical cylinder which revolves slowly but continuously by power transmitted from the clock. The perforations are made by steel points attached to

the interior ends of a series of horizontal levers. The pressure on the buttons operates the levers, and when a button is pushed a bell rings. There are as many buttons as levers. The manufacturers claim that their device is exceedingly simple. Ignorant persons can record with slight instructions; at most it is necessary to teach the location of the button in case the employee cannot read. The buttons are always in the same place and are so arranged to facilitate the learning of their location with the least possible effort. It is claimed that in the regular course of business 100 employees can readily register in one minute on one recorder. The Simplex recorders are built by expert mechanics at Gardner, Mass. The clock movements are made by the Seth Thomas Clock Company of Thomaston, Conn., and the recorder case is of iron enameled in black and ornamented in gold. Many of them, we are advised, are in use in prominent manufacturing establishments throughout the country.

### The Ideal V-Block.

The V-block made by the Ideal Machine Works, Hartford, Conn., will be found convenient for drilling shafts, as the block can be placed so that the drill will pass between the jaws and not into them when drilling through the piece. The block is made entirely of hardened steel.



THE IDEAL V-BLOCK.

One block slides freely, while the other is secured to the ends of the rods. The dimensions are  $1\frac{3}{4}$  inches high,  $1\frac{1}{2}$  inches wide and 5 $\frac{1}{4}$  inches long. This block will hold shafts up to 4 inches in diameter.

### One View of the Lake Trade.

Seldom has the season on the lakes seen more ups and downs than the one which closed on the 6th inst. with the sailing of the steamer "Frank Rockefeller" from South Chicago with grain for Buffalo, says an exchange. When it began shippers were paying half what boats were worth for their use during the season. Before the season had become old vesselmen were scouring the lakes for cargoes, and long before it had half passed over 50 of the largest and most economical carriers on the lakes, forming the larger part of the Rockefeller fleet, were tied to the docks. In that respect it was different from anything the oldest veteran in the service had ever seen. For the first time an attempt was made to corner lake freights, and it was due wholly to that fact that the average daily rates were higher than in 1898, when they were close to the actual cost of transportation. Compared with the daily averages of the two preceding years the averages of 1900 were:

	1900.	1899.	1898.
Chicago corn.....	1.80	2.7	1.5
Duluth wheat.....	2.11	2.6	1.8
Duluth coal.....	39.31	45.4	23.4

The daily average of freights on iron ore from the head of Lake Superior to Ohio ports during the season was 85.45 cents. The season contracts, which covered by far the largest part of the ore moved, were at \$1.26. The daily average is not a fair indication of the average rate per ton paid, for by far the largest part of the ore was moved at 60 and 65 cents per ton, or about half what the Rockefeller corner forced season rates to.

Vessel owners who had these season contracts, which represented profits of 25 to 40 per cent. on their vessels, were fearful that the iron mining companies would not carry out the deals when the slump came. In this they were generally mistaken; as a general rule the mining companies dealt fairly with ship owners. A year ago it seemed likely that the days of the individual vessel owner on the lakes were numbered, and that

the traffic was to pass into the hands of great corporations. Now the tendency is in the opposite direction. None of the big steel combinations have ordered a ship this fall, while the shipyards are filled with vessels which have been ordered by private enterprise. The combinations seem disposed to let lake transportation alone, except as they have already invested in fleets.

It is not thought that much figuring will be done on next year's business before January. A contract entered into between the Rockefeller and Carnegie interests by which the price of carrying ore from the head of Lake Superior to Ohio ports was fixed at 50 cents per ton, the shipper to pay the unloading charges, amounting to about 20 cents, has been generally taken by vessel owners as the probable rate on which business will be done the coming season. The material improvement in the iron trade since election may result in a slight advance in carrying charges on the ore, but that is problematical. It is certain that the Rockefeller ships the coming season will be engaged in carrying Rockefeller ore, and that the big fleet of chartered vessels which was engaged in that profitable occupation the past season while the Rockefeller ships were in idleness will have to seek other fields of employment.

A complete change in the system of unloading iron ore cargoes, by which shippers will pay for the unloading instead of the vessel owners, is now receiving the attention of marine men all over the lakes, and it is likely that the change will be made the coming winter. It will do away with the numberless strikes and all kinds of trouble between vessel masters and the gangs of workmen unloading their ships, and it is claimed it will result in a decided benefit in the general handling of labor on the docks. The amount paid for carrying ore will bring it to the ore receiving dock. The rates will be figured on the old basis, less the handling charges.

It is said that the anxiety of vessel owners to get their boats out of port has had a tendency to corrupt the unloaders, who have come to think more of the extra bonus given them at critical times than of their regular pay. A good many abuses have crept in, and the only way to correct them was to do away with the whole system.

On Chicago River, where the same conditions are experienced in loading grain, it is the invariable rule of Armour & Co. to allow no direct payment from the vessel owner to the firm's employees for extra work. All such matters are handled by the firm. The same rule is followed by the other grain companies. The result has been that nowhere on the lakes is less trouble experienced in loading vessels during overtime and on Sundays than in Chicago.

The Buffalo coal trade was so upset by the great strike that figures regarding it are useless for the purposes of comparison. The season has been immensely profitable to vessel owners who had contracts and but fairly so to those who depended upon cargoes from trip to trip. Although it has not been so roseate as ship owners expected, there is now none of the feeling of extreme depression which marked the close a number of seasons prior to 1898. None are more confident of the year's business to come than the men who went through the time of depression. The general forecast of these veterans is that 1901 will see an immense volume of business in all lines of traffic, with moderate rates and a moderate return of profit to ship owners.

The American Smelting & Refining Company have placed an order for a large compound air compressor with the establishment of J. Geo. Leymer, Denver, Col. The placing of this order is regarded with great satisfaction in Denver machinery circles, being taken as an indication that the local manufacturers of mining and smelting machinery are making satisfactory progress in meeting the requirements of the Western mining trade for high class machinery. The new compressor will be used in the Globe smelter of the American company.

Very low prices have prevailed lately for Portland cement. A contract for a lot of 48,000 barrels for a Government dam was taken lately at 85 cents per barrel at mill in Eastern Pennsylvania.



## The Mechanical Engineers.

### Forty-second Meeting.

The New York meeting of the American Society of Mechanical Engineers, which closed last Friday, was the most successful in point of attendance ever held. Up to Thursday 707 members and guests had signed the register. In addition to those printed in our last issue, the following were in attendance:

#### List of Members.

Wm. Johnston Andrews, president the Raleigh Electrical Company, Raleigh, N. C.  
Joseph E. Aue, superintendent the De La Vergne Refrigerating Machine Company, foot East 138th street, New York.  
A. F. Bardwell, chief engineer Daimler Mfg. Company, Long Island City, N. Y.  
Geo. Bartol, general manager Otis Steel Company, Limited, Cleveland, Ohio.  
Henry B. Binasse, proprietor Newark Machine Tool Works, Newark, N. J.  
John D. Bird, superintendent Ball & Wood Company, Elizabeth, N. J.  
H. M. Boles, Scranton, Pa.  
Geo. M. Bond, manager Standards and Gauge Department Pratt & Whitney Company, Hartford, Conn.  
Sterling Haight Bunnell, engineer and manager the Cochran Company, Lorain, Ohio.

Joseph E. Lewis, mechanical engineer the Whitlock Coil Pipe Company, Hartford, Conn.  
Sam. H. Libby, engineer railway department Sprague Electrical Company, Bloomfield, N. J.  
E. H. Lockwood, instructor mechanical engineering Sheffield S. S., Yale University, New Haven.  
John Loyd, proprietor New York Machine Knife Company, 558 Water street, New York.  
A. F. Nagle, mechanical engineer Manhattan Railway, N. Y.  
J. F. Max Patitz, draftsman the E. P. Allis Company, Milwaukee, Wis.  
Wm. Henry Peirce, manager Baltimore Copper S. & R. Company, Baltimore, Md.  
Edgar Penney, president Newburgh Ice Machine & Engine Company, Newburgh, N. Y.  
Albert D. Pentz, the Singer Mfg. Company, Elizabethport, N. J.  
Adam Riesenberger, professor mechanical drawing Stevens Institute Technology, Hoboken, N. J.  
William R. Roney, care of Westinghouse, Church, Kerr & Co., 26 Cortlandt street, New York.  
Peter Schwamb, professor mechanism and director workshops Massachusetts Institute Technology, Boston.  
Edward Theodor Sederholm, chief engineer Fraser & Chalmers, Chicago.  
T. Jackson Shaw, superintendent engineering Harlan & Hollingsworth Company, Wilmington, Del.  
Thos. Shipley, general manager York Mfg. Company, York, Pa.  
Geo. A. Tibbals, the Continental Iron Works, Brooklyn.  
Albert de Verastegui, Babcock & Wilcox Company, 29 Cortlandt street, New York.  
Fred. A. Waldron, superintendent power plant Yale & Towne Mfg. Company, Stamford, Conn.  
William O. Webber, cons. engr., Boston.  
Robt. Alexander Widdicombe, engineer Western Electric Company, Chicago.  
Chas. H. Zehnder, president the Dickson Mfg. Company, Scranton, Pa.

The session Thursday morning was held in the large lecture room of the Havemeyer Hall, Columbia Univer-

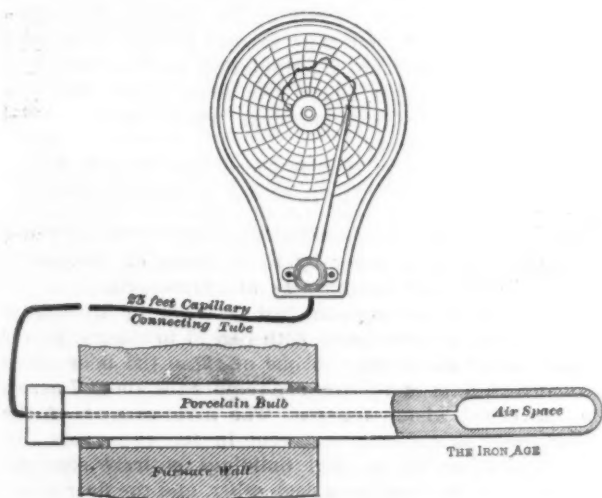


Fig. 1.—Sketch Showing Arrangement of Parts.

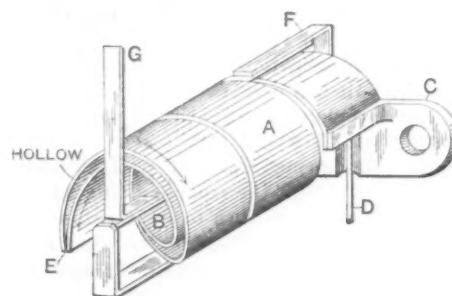


Fig. 2.—Indicating and Compensating Springs.

### THE BRISTOL RECORDING AIR PYROMETER.

A. L. Burns, erecting engineer Jabez Burns & Sons, 542 Greenwich street, New York.  
Geo. E. Camp, superintendent Standard Harrow Company, Utica, N. Y.  
Hugh Vincent Conrad, superintendent Rand Drill Company, North Tarrytown, N. Y.  
Orton G. Dale, engineer John A. Mead & Co., 11 Broadway, New York.  
W. P. Dallett, engineer Deming Company and Buffalo Steam Pump Company, Philadelphia.  
Wm. H. Derbyshire, president Chambersburg Engineering Company, Chambersburg, Pa.  
Geo. Dinkel, Jr., chief engineer American Sugar Refining Company, Jersey City, N. J.  
James M. Dodge, president Link Belt Engineering Company, Dodge Coal Storage Company, Philadelphia.  
Edward Ducommun, assistant chief engineer American Sugar Refining Company, Jersey City, N. J.  
Erwin Graves, superintendent Camden Iron Works, Camden, N. J.  
Carl L. Grohmann, chief draftsman Dow Composing Machine Company, Park Row Building, New York.  
Albert Francis Hall, M. E. with the George F. Blake Mfg. Company, E. Cambridge, Mass.  
George Fiske Hardy, assistant manager department construction and maintenance International Paper Company, New York.  
Henry J. Horstman, the Compressed Air Motor Company, Chicago, Ill.  
Horace Kimball Jones, mechanical superintendent Russell & Erwin Mfg. Company, Hartford, Conn.  
Harry M. Lane, president Lane & Bodley Company, Cincinnati, Ohio.  
Gaetano Lanza, professor mechanical engineering Massachusetts Institute of Technology, Boston.  
Henry Martin Leland, general superintendent Leland & Faulconer Mfg. Company, Detroit, Mich.

sity. The afternoon was devoted to an inspection of the buildings and equipment of the university. One of the papers presented at this session, and illustrated with the apparatus, was by Prof. Wm. H. Bristol of Stevens Institute of Technology, on

#### A New Recording Air Pyrometer

which was in part as follows:

The instrument herein described has been designed to meet a demand for a pyrometer to measure temperatures of high ranges, and to give continuous records of changes of such temperatures on a moving chart; also to produce an instrument which would be self compensating for barometric and thermometric changes of the atmosphere without introducing delicate mechanism which would tend to inaccuracy and to preclude its use for commercial purposes.

The diagram, Fig. 1, shows the arrangement of the parts of the pyrometer, which consist simply of a porcelain bulb connected by a capillary tube to a recording pressure gauge. The stem of the porcelain bulb is made of sufficient length to pass through the furnace wall. The capillary connecting tube is made of seamless copper. The recording pressure gauge employed is constructed on the same plan as those described in previous papers. By reference to the description it will be found that each pressure tube or spring is constructed on the Bourdon principle, and consists of a tube of closely flattened cross section formed into a helix of two complete turns.

Two of these pressure tubes or springs are employed in the recorder—one of these, the indicating tube or spring, being connected to the air bulb by the capillary tube and adapted to be turned axially by the variations of pressure due to changes of the temperature to be measured; the other, a compensating spring, is mechanically attached to the free end of the indicating tube or spring.

The compensating spring is adapted to be turned axially by variations of atmospheric pressure and temperature in a direction opposite to the motion of the first or indicating spring under the same influences.

The air bulb, capillary connecting tube and indicating spring are almost exhausted of air, so that when the air bulb is cold it is subjected on the exterior to nearly atmospheric pressure; but when the bulb is exposed to high temperatures the remaining inclosed air is expanded so as to practically balance the external pressure, and the bulb is relieved of strains which would, in its weakened condition, tend to injure it.

Fig. 2 shows the indicating and compensating springs of the recorder on an enlarged scale. C is the bracket to which one end of the indicating spring B is secured; D represents a portion of the capillary connecting tube where it enters the stationary end of the indicating spring. The compensating spring A is helically formed in the same direction as the indicating spring, but of a larger diameter, so that it may be placed outside of and concentric with the indicating spring, as shown, and is mechanically attached at E, there being no opening or connection between the interiors of the two springs. At the free end of the compensating spring a bracket, F, is soldered, making a rigid connection to a shaft through the center of the springs. At the front end of the shaft the recording arm G is rigidly secured.

To illustrate the operation of the compensating spring, assume that the air has been partially exhausted from it and that the barometer rises. Under such a condition the indicating spring would turn to the left, Fig. 2, in the direction of arrow 1; but the compensating spring A being present and tending to turn to the right, as indicated by arrow 2, through the same angle, the effect of changes in atmospheric pressure is neutralized, and the position of the recording arm is unaffected by the rise of atmospheric pressure. For the same reasons there would be no movement of the recording arm when there is a fall in atmospheric pressure.

If the air is not entirely exhausted from the compensating spring it will also compensate or thermometric changes in the same manner, the indicating spring tending to turn in the direction of arrow 1 when the temperature falls and in the direction of arrow 2 when it rises; while the compensating tube will be turned in opposite directions equal amounts under the same influences. By leaving the proper amount of air in the compensating spring the compensation may be made perfect for any change of atmospheric temperature, provided the air bulb is at a given temperature. The error for small variations from the average temperature to be measured will be so small that it may be neglected. As the tubes are turned in opposite directions by barometric and thermometric changes it is evident that there will be no movement of the recording arm unless due to changes of pressure communicated to the indicating spring through the capillary tube from the air bulb exposed to the temperature to be measured.

The helically formed pressure springs are particularly well adapted for use in this instrument on account of the small internal space, which, together with that of the capillary connecting tubes, forms a small volume in comparison with that of the air bulb.

Thus far special attention has been given to working out the mechanical features of the instrument and to determine experimentally on the most practical form of the porcelain air bulb, and how these bulbs may be applied to continuously record high temperatures. As the volume of air space outside of that exposed to the temperature to be measured is very small, and as there are no corrections or computations necessary for barometric or thermometric changes, it will be a simple

matter to calibrate the instrument according to the theory of the air thermometer, which is a recognized standard for measuring temperatures. The instrument here exhibited has been calibrated by comparison with a standard from 32 degrees up to 600 degrees F., and by the melting points of aluminum and copper for the scale up to 2000 degrees F.

This instrument is the joint invention of E. H. Bristol and the author.

#### Discussion.

In the discussion of this paper Professor Bristol explained that the particular tube he exhibited had been in a furnace for six weeks, and was as perfect as when introduced. The greatest difficulty he had found with these tubes was that the glazing was liable to crack and permit the entrance of air, thereby destroying the partial vacuum in the bulb. A platinum bulb was out of the question on account of its great cost. In answer to a question as to the temperatures which the instrument would record and whether 2700, 2800, or even higher could be handled, Professor Bristol said that as yet he made no claim for these high degrees of heat. The instrument had been used with the greatest success as high as 2000 degrees, and had been tested with most favorable results as high as 2200 degrees. Time would develop its adaptability for the higher temperatures. Concerning the handling of the porcelain tubes the professor said that they seemed to fall down even with the most delicate manipulation and to withstand comparatively rough usage. No explanation was presented of this seeming paradox. These tubes are imported from Germany.

Mr. Henning said that tubes of this kind had been used with good results in furnaces on the Continent.

**Power and Light for the Machine Shop and Foundry** was the title of a paper by F. R. Jones of Worcester, Mass. The following extracts are presented:

The writer has recently had occasion to investigate the plants of two concerns with regard to electric power transmission and light. In one of these the floor space over which light and power are required is about 7 acres; in the other, about 4 acres. The arrangement of the floor space is radically different in the two cases. In the first there are several buildings entirely separate and at some distance from each other, and the floor space is nearly all upon the first floor, there being a small amount upon the second floor and next to nothing on the third floor. In the second the floor space is nearly all in an L-shaped building, partly of four stories and partly of three, and, in addition to this, a small two-story structure setting close to the other building within the inner angle of the L.

The output of each establishment is in a way similar, both producing iron machinery chiefly. In the smaller establishment the product is much lighter in weight than in the larger. The operating machinery in the two plants is quite similar. The lighter machinery is about the same in each, but the larger has a considerable amount of heavy machinery which has no counterpart in the smaller. Both plants were examined to see what requirements would have to be fulfilled by an electric system, or systems, for power transmission and lighting.

The selection of a single system from which all apparatus might be operated was based upon the conviction that, for machine shop and factory purposes, it is exceedingly desirable to be able to interchange similar apparatus and to place any piece of apparatus anywhere upon the system, thus obtaining the maximum flexibility and greatest facility for operating portable machine tools at any point, and also to allow for alterations and extensions of the works. The study of the requirements of every form of apparatus that might be brought into use and demand current from the system was naturally necessary in order to decide whether direct current, single phase alternating or polyphase should be used.

The oldest of machine tools, the lathe, was taken up first, and since in both establishments it was deemed advisable to have some lathes driven individually by variable speed motors, and that the variation of speed should cover, by small steps, a considerable range, the only thing that seemed satisfactory for this purpose in



the present state of speed regulation for different types of electric machinery was the direct current. And, in order that the range of speed variation might be as great as possible, the multiple voltage system appeared to be advisable, even though the speed regulations were to be made, for a given supply circuit voltage, by rheostatic control of the current in the magnet coils of the motor.

Other machines of a nature in a way similar to the lathe, so far as their driving is concerned, among which may be included the boring mill, drill press, shaper, slotter, gear cutter and screw machine, can be operated satisfactorily under conditions of speed variation similar to those which answer for the lathe.

The planer, whose reciprocating motion requires the reversal of nearly every part of its machinery, presents a problem which is not yet satisfactorily solved for electric driving by a direct connected motor. The nearest solution that has been reached is to drive its countershaft in one direction continuously, just as it might be driven from a line shaft, and effect the reversals of the machine in the ordinary method common to mechanical driving. The ability to secure different cutting with maximum return speeds for machines of this type is unquestionably desirable when working upon different kinds of materials or for taking heavy and light cuts. Different speeds can be obtained readily with many types of direct current motors by rheostatic control of the field magnet current and, therefore, this feature needs no further attention than already given the lathe.

Nearly all electric hoists and cranes are now operated by constant pressure direct current motors. They seem to be at least as satisfactory as those driven by any other type of current.

Constant potential direct current arc lamps have long shown themselves efficient, durable and otherwise satisfactory. They can be operated individually and economically at any pressure between 100 and 125 volts, even though the pressure fluctuates considerably. (It is not intended that these are the limiting pressures of satisfactory service.) The lamp is, of course, more economical at its rated pressure without any of its rheostatic resistance in circuit. Incandescent lamps have long been operated at from 100 to 110 volts with perfect satisfaction.

Motors for electric cranes and for general power purposes about the machine shop can be operated satisfactorily at any of the ordinary pressures for running motors, but it was not thought advisable, especially in connection with the conditions to be met in operating other apparatus, to give them a pressure greater than from 220 to 250 volts. The higher the voltage, within practical limits, the greater the economy of wire in the electrical circuit, of course. But, even leaving the requirements for other apparatus out of consideration, voltage as high as 500 is not desirable for the machine shop and foundry, for there is always a considerable degree of probability that employees will receive shocks by coming in contact with the wires or machinery. The writer's experience has given him sufficient respect for a 500-volt circuit to make him wish to keep others away from it.

On the whole, it was, therefore, concluded that 220 volts for the majority of motors and 110 volts for arc and incandescent lamps would be the most suitable. These voltages can be obtained, as is well known, by the three-wire system which has been so long in use.

In order to obtain information as to the amount of power required for driving different parts of the plant numerous tests were made upon individual machines, groups of machines, sections of line shafting, cranes and elevators. Although so much data have already been published showing the power required to drive machine tools for iron working and wood working, it is believed that there are some points of sufficient value among those obtained in these tests to entitle them to attention. The data given below are of a nature not generally found in the reports that have been made upon electric driving, but present some rather unusual cases.

**Power Required by Lathes.**—The power required to drive a couple of lathes, one of 48-inch and the other 36-inch swing, was taken when both were polishing hollow

cylindrical columns, one 10 inches in diameter and the other 12 inches. In both cases the polishing laps gripped the work so tightly as to keep the driving belt of each lathe on the point of slipping. The speed was as high as could be safely used for machines of this size. To drive the two lathes together under these conditions something over 7 mechanical horse-power delivered by the motor to the belt running from its pulley was required. It can be seen that this is considerably more than is required for a lathe performing any of the operations common to machine construction in the ordinary shop. It may not equal the amount of power necessary for taking heavy cuts upon large steel shafts, heavy gun tubes and jackets, &c. It does represent the power, however, which must be used as a basis to determine the size of a motor to drive a lathe which must do such work as demanded for these two. If a number of lathes for this class of work are to be grouped together, and there is a possibility, which is very probable, that several of them may have polishing under way at the same time, and therefore demand a maximum amount of power, the motor for driving them as a group must naturally have a capacity equal to the combined maximum demands of all of them, due allowance being made for its ability to stand overloading for a short period of time.

**Power Required by Planer.**—Although it is well known that the power required to drive a metal working planer is generally greater on the return stroke than for the forward, or cutting, stroke, and that, at the time of reversal, the power demanded is exceedingly greater than at any other time, the following data may not be out of place.

Two planers, one with 22-foot table and 120 inches between housings and the other with 25-foot table and 72 inches between housings, were both driven by one motor belted to a jackshaft, which in turn drove the two countershafts of the planers. The following data were obtained:

*120-inch Planer with 22-foot Table and 72-inch Planer with 25-foot Table. 230 Volts.*

Both machines driven by one motor. Jackshaft running in all cases.

Amperes.

- 20 One countershaft.
- 60 Average for 120-inch planer on cutting stroke, light cut, and one countershaft.
- 55 120-inch planer reversing from return to cutting stroke.
- 110 120-inch planer reversing from cutting to return stroke.
- 27 Both countershafts.
- 240 } Both planers reversing from cutting to return stroke.
- 250 }

Both machines were working upon rather heavy castings and taking comparatively light cuts at short strokes over bosses and parts of the castings where other members of the machines were to be attached. The power, therefore, is approximately that which would be required to drive the machines without taking any cut, but carrying loads upon their tables. It may be noticed that the amount of power for reversing the 120-inch planer was about 1.8 times that for its average running at times when not reversing. When it happened that both machines reversed at the same time from the forward, or cutting, to the back, or return, stroke, the power required ran up to a very great amount, more than 60 mechanical horse-power. This amount of power was not indicated by the instantaneous extreme throw of the ammeter needle, but was the reading at which the ammeter stood steadily for some seconds, a period long enough to make the demand distinctly felt by the engine and generator.

A planer with a 24-foot table and 60 inches between housings showed the following amount of power required:

*60-inch Planer with 24-foot Table. 230 Volts.*

Amperes.

- 7 Shafting only.
- 8-9 Forward stroke without cut.
- 10-15 Light portion of cut on rough casting,  $\frac{1}{8}$ -inch feed.
- 15-20 One tool cutting cast iron 5-16-inch deep x  $\frac{1}{8}$ -inch feed.
- 20-25 One tool cutting cast iron 7-16-inch deep x  $\frac{1}{8}$ -inch feed.
- 20-25 Cutting 1 1-16-inch groove in cast iron with square nose tool; feed between 1-32 inch and 3-64 inch; groove not cored.
- 35 Reversing from return to cutting stroke.
- 45 Reversing from cutting to return stroke.

It may be noticed that the power required for reversing this machine, especially from the cutting to the higher speed return stroke, is nearly double that for the forward stroke when cutting.

**Power Required by Crane.**—Of the 20 odd traveling cranes in one establishment, ten were tested for the power required to drive them. Of these ten, some were driven electrically and some mechanically. The majority of the electrical cranes were of the ordinary types designed for electric driving. One was a remodeled crane which had originally been driven mechanically by a square shaft running alongside the building parallel to the track. Some of the mechanically driven cranes were furnished power by a square shaft alongside the building and parallel to the track, and others by a flying rope running alongside the track. Obviously, in providing for the power to drive a crane it is necessary to know the maximum amount of power that it may demand for a period of time great enough to make the demand appreciably felt by the generating plant. In this respect the following data, obtained from three electric traveling cranes of 30 tons capacity each, all traversing the same track above the foundry floor, show how great may be the demand, for an appreciable period of time, by some one of the cranes, and, with perfect possibility, by all of them at the same instant.

Each of the 30-ton cranes was equipped with four motors, 25 horse-power for bridge travel, 8 horse-power for trolley travel, 25 horse-power for the main hoist and 16 horse-power for the auxiliary hoist.

**30-ton Electric Traveling Crane No. 1. Pressure, 240 Volts when Crane was Taking No Current.**

Amperes.

125	Bridge starting, no load.
50	Bridge travelling uniformly, 350 feet per minute, no load.
33 to 40	Lowering, no load.
105	Starting to hoist, no load.
36	Hoisting uniformly, no load.
145	Bridge starting, 20-ton load.
50	Bridge moving uniformly, 240 feet per minute, 20-ton load.
95	Hoisting 20 tons uniformly at 10 feet per minute.
310	General maneuvering, 20-ton load.
200	
150	
150	

**30-ton Electric Traveling Crane No. 3. 240 Volts.**

Amperes.

90	Bridge starting, no load.
50	Bridge travelling uniformly, 535 feet per minute, no load.
38	Lowering uniformly, no load.
40 to 45	Hoisting uniformly, no load.
150	Bridge and trolley starting, 20-ton load.
30	Trolley at uniform speed, 20-ton load.
34	Hoisting uniformly at 11 feet per minute, 20-ton load.
240	Bridge and trolley maneuvering, reading for three seconds, 20-ton load.
320	General maneuvering, 20-ton load.
250	
200	
230	
180	

It can be seen, by examining the data obtained from these 30-ton cranes, that when all the motions on one were in operation simultaneously, and when two or more of the movements were started at about the same instant, the demand made for power during this general maneuvering was very great indeed. The readings given for such general maneuvering for two of the cranes when carrying a load of 20 tons each, the reading running as high as 320 amperes in one case and 310 in the other, represent demands for current during periods of from five to ten seconds' duration, as shown by the steady reading of the needle of a dead beat ammeter. It not unfrequently happens that such a condition comes about in every day practice. That two or more of these cranes did, when in regular service, make very heavy demands for current at the same instant, was clearly shown by watching the ammeter at the switchboard of the generator supplying current to the three cranes only. Although this generator had sufficient capacity to operate several 30-ton cranes under what might be called average load, and the magnetic circuit breaker for the generator was set considerably above the steady load capacity of the generator, it was not an unfrequent occurrence for the circuit breaker to open up the circuit on account of the great momentary demands made for power by the cranes.

Tests upon a 15-ton electric crane, two 5-ton electric cranes, a 15-ton flying rope crane, a 15-ton square shaft crane and a 15-ton square shaft crane remodeled to be driven direct by an electric motor, all showed similar heavy momentary demands for current under general maneuvering.

**Power Required by Elevator.**—A somewhat surprising condition was found in one of the elevators, which, during the regular operation of the shop, was driven mechanically from the line shaft by means of a worm and worm wheel connected to a winding drum for the elevator cable. The elevator was of comparatively small capacity, and should not ordinarily require probably more than 5 horse-power to drive it. But, apparently on account of some fault of the worm and worm wheel mechanism, the very excessive amounts of power shown in the data given for this elevator were sometimes required.

**Elevator Operated by Worm and Worm Wheel.**

Mechanical horse-power.

Going up.	Coming down.	
19.2	10.4	No load.
16.5 to 21.8	...	No load.
...	0.1	After running some time.
2.5	...	One man on.
...	0.1	Countershafting only.
7.8	...	2-ton load, estimated.
7.3	...	2-ton load, estimated.

When well oiled 15 amperes were at one time required to lower the cage without load; but on the following trip, immediately after, 60 amperes were required to lower without load. The next trip down took only 15 amperes. The same variation of power occurred throughout the test.

The worm and wheel mechanism appeared to be in proper condition, however, as far as could be seen by outside inspection. It was well lubricated by a bath of oil and flake graphite, in which the worm ran. Here seems to be a lesson in the use of the worm and worm wheel mechanism setting forth the fact that care should be taken in its adjustment, and to see that the rubbing surfaces of the worm and wheel are kept in proper condition.

**Power Required by Fans.**—Two fans, used in connection with steam coils and hot air pipes for heating of buildings, took the following amounts of power to drive them. They were both of the radial blade, fan wheel type (the blades arranged as on the paddles of a side wheel steamboat). The casing of the larger measured 108 inches in diameter by 60 inches wide, the latter measurement taken parallel to the main shaft. There were two tangential discharge openings in the case: one at the top, 24 x 60 inches, and another at the bottom, 54 x 28 inches; the larger dimensions in both openings were parallel to the fan shaft. The rotating part of the smaller fan measured 60 inches in diameter by 28 inches wide. It had a single outlet, 29 x 31 inches. Each fan had been installed by its manufacturer in connection with the other parts of the heating system. The larger one was not brought up to its rated speed because the power required to drive it was much more than anticipated when a motor of 20 horse-power capacity was belted to it. The slipping of the belt was the real limiting cause for not applying more power with the 20 horse-power motor. There was not time to substitute a larger motor or another belt:

**108 x 60 inch Fan for Heating.**

Mechanical horse-power.	Revolutions per minute.
20.6	160
23.6	180

**60 x 28 inch Fan for Heating.**

Mechanical horse power.	Revolutions per minute.
0.8	120
1.2	176
4.8	275
11.4	360
12.5	370

**The Current.**—By examination of the data given above it may be seen that the constantly recurring and great momentary demands for power made by cranes and hoists would necessarily affect the pressure in the wires carrying current to them from the switch board in the power house. Hence the circuit feeding the crane and elevator motors would not be suitable for also furnish-



ing current to motors which require to be run at even a fairly constant speed, or even hardly for incandescent lights in places where a steady illumination is not essential. It would be difficult to find constant voltage arc lights that would operate with even a fair degree of satisfaction at the points of greatest variation of pressure in the circuit. It therefore becomes necessary to have what might be called a "crane circuit" for at least the majority of the larger cranes in an establishment of the proportions of those mentioned earlier in this paper.

The incandescent lights for use in offices, drafting rooms, and possibly some parts of the shop itself, as the tool room, and where the small and more accurate parts are manufactured, must have a pressure in the circuit leading to them which, at least, does not fluctuate rapidly, even though it may be allowable for it to vary slowly to a slight extent. A lighting circuit, primarily intended for incandescent lighting, therefore, also becomes a necessity.

Such machinery as lathes, drill presses, shapers, milling machines, slotters and gear cutters does not ordinarily need to be driven at a speed that is even very uniform. Variation of speed on each side of the normal is allowable to a considerable extent in many cases, provided the variation is not a jerky one, such as often comes on line shafting used to drive heavy planers. A third circuit, primarily intended for driving machinery of this class, needs to be installed. This may be conveniently referred to as a "machine tool circuit."

Whether an iron working planer may be placed upon the machine tool circuit depends largely upon the size of the planer. The heavier machines, on account of the great momentary demands they frequently make for power, would be apt to produce sudden and considerable variations of pressure in the machine tool circuit. Better general operation of the entire plant can be obtained by placing them on the crane circuit. The smaller planers can safely be placed upon the machine tool circuit, thus obtaining more uniform motor speed for driving them, while not materially affecting the pressure in the latter circuit.

Certain classes of machine tools, including the emery grinder for finishing reamers, mandrels, and accurately formed machine parts, require a very constant speed for the production of well made pieces. A jerky speed, as of a line shaft forming part of a system on which are heavy metal working planers, causes the grinding wheel to cut deeply into the work in some places, thus making a well finished product impossible. Power for light machines of this type may be taken from the lighting circuit without detriment to its constant pressure. Desk fans, and even larger ones, can also be connected to the lighting circuit without harm.

On account of the great variation in the amount of power demanded by cranes and other classes of machinery already mentioned it was doubted whether all the circuits leading out through the works could be connected to the same bus bars in the power house without causing a fluctuation of pressure great enough at the bus bars to affect appreciably the constant brilliancy of the incandescent lamps placed in locations where the most steady light would be required. Just what would be the effect could not be predetermined. For this reason it was decided that the switch board should be so made and the generating machinery so divided into units that, if the amount of fluctuation caused in the incandescent lights should be too great when feeding all circuits from the same bus bars, the crane and heavy planer circuit could be thrown on to one generator, and the other machinery and lights fed by another generator. If, as was hardly supposed would be the case, even with this arrangement the incandescent lamps should not burn steadily enough, there would still remain the expedient of a separate generating unit for the lighting circuit. The supposition was that, even though such a separate lighting unit might be necessary at the times when the cranes would be performing their heaviest duty, which is while running off a heat in the foundry, there might be other considerable periods of time when the demands by the cranes would not be sufficient to affect the lights appreciably, even though all were operated

from the same bus bars. Such being the case, the lighting unit would have to be operated a small part of the time.

*Two Generating Units.*—It seems advisable to install at least two generating units exactly alike, and to have one small unit which might be used for furnishing the current to run one or two machine tools, or even a small electric hoist or elevator, when there might be a demand for such service on account of making repairs, or operating some one or two machines on holidays, or in case of a breakdown. Such a unit to be driven independently of the main power plant, so that, even though the fires might be dead under the boilers, this extra unit could be operated. A unit consisting of a small generator driven by a water wheel, or by a gas or gasoline engine, would answer such a purpose. Two large units, running in parallel, for carrying the bulk of the load, or separately for dividing it between them in case the cranes and heavy planers would have to be driven separately from the other machinery, would give a desirable division of the power units for night work and when operating only a part of the plant. This would give an opportunity for repairing the generating units without hindering the running of the entire establishment. Direct connected units were selected as most suitable. While it is not believed that great multiplicity of generating units is desirable, it is thought certainly better to have at least two main units for the reason already stated.

A motor generator was decided upon as the best apparatus for balancing the two sides of the three-wire circuit. In a plant where the installment of electrical machinery for power transmission goes on gradually the motor generator may be made of an ordinary commercial motor and generator. When the demand upon them becomes too great for their capacity they may be replaced by larger machines and used for motors in some part of the establishment. It was not thought that a storage battery would be as satisfactory for balancing the system as the motor generator.

*Individual or Group Driving.*—The question of individual driving, or group driving, of the machine tools naturally came up. The solution depended almost wholly upon the ability of arranging the tools for group driving, or the necessity of driving some individually on account of the location each should occupy in order that it might perform its special functions to the best advantage. As to what would be the most efficient limit for the smallness of motors for driving did not once come up. And the writer has been led to believe, by close examination of these two plants and the more general observations of many others, that, except for very light machinery, there is seldom any need of considering which would be the most efficient method of driving, group or individual; or what would be the smallest size of motor to be used for groups, the limit of subdivision being based upon considerations of efficient power transmission. Convenience of operation and the methods of securing the greatest amount of output from operating machinery are of so much greater moment in most cases than economy of driving in pounds of coal saved that the latter sinks into insignificance in comparison with the former. Where it is desirable to have a machine driven at a variable speed of such a nature that it can be obtained only by a corresponding variation of speed in the source of its power, then, in the general case, it is undoubtedly better to drive that machine individually by a variable speed motor, whatever the amount of power required for driving it. On the contrary, if there are a number of machines whose speed regulation can be satisfactorily secured through the ordinary mechanical connection with a uniformly rotating shaft, and they can be grouped together and still perform their functions to the best advantage, then unquestionably the best method of driving is to use, within the limits of convenient arrangement, as large a motor as possible.

The installation of small hoists suitable for serving machine tools, when the work handled is generally too large for one man to put in place, is one of the improvements in the modern machine shop which has worked much benefit and saved much time. When the work to be lifted varies in weight from 75 to 500 pounds it is

believed that the pneumatic hoist is generally best for the purpose.

The conveying of materials and machinery from building to building and through the yards of a large establishment must needs be done, if done expeditiously, by some form of industrial railway. The form of locomotive most suitable for this purpose is not easy to decide upon. The horse hardly enters into consideration, and men are too expensive for the purpose. On account of the necessity of running through shops containing finished product and valuable machines, a steam locomotive cannot be used on account of the deleterious fumes thrown out, not to mention the fire risk. The compressed air locomotive appears to have proved more expensive than the electric for such purpose, and the choice seems to be guided toward the latter. Current can be furnished for the electric locomotive most conveniently and economically by the overhead trolley system outside of the buildings and wherever else trolley wires can be erected. In most places inside the buildings, however, the trolley cannot be used, so some other means must be obtained for furnishing current to the locomotive. There seem to be two methods that merit consideration—namely, by the storage battery and by the contact system of a shoe underneath the locomotive rubbing against contact points placed alongside or between the tracks. The writer is in doubt as to which would be the more suitable.

*Cranes.*—While watching the operations of electric traveling cranes, frequently when in the cage with the operator, the writer has always been impressed with the need of fewer levers for controlling the different motions. In a traveling crane with a single hoist there are three controllers, each with its individual lever; one for the motion of the bridge along the stationary track on which the entire crane runs, one for the traverse of the trolley across the bridge, and a third for hoisting and lowering a load. If the crane has an auxiliary hoist, which is very common in practice where two are needed, then a fourth controller and lever are added. On account of the necessity of quickly grasping and moving one lever after another, the operator is apt to move them more quickly and further than is necessary, thus throwing on a sudden heavy current, which strains and racks the machinery. This is the usual occurrence when quick time must be made.

It would not be a difficult or expensive task to have, for a single hoist traveling crane, one lever to control any one of the three motions and another to control the remaining two motions. One lever could control the bridge travel and the other both the hoisting and trolley traverse, the hoisting by moving the lever in a vertical plane and the trolley traverse by moving it horizontally. A combination of these two motions of this lever would control both the hoist and traverse at the same instant.

For a crane having a main and an auxiliary hoist, each of two levers could control two motions. One could control the main hoist and traverse, and the other the auxiliary hoist and bridge travel. By such a method of two-lever control the saving of time and machinery would amply repay the extra expenditure necessary for suitably arranged controller levers, the additional cost of which need not be very great.

*Power Required.*—Indicator cards were taken from the five engines furnishing power for the mechanical driving system of one of the plants. These cards were taken at the time when the load upon each engine was at the maximum value that it was found to reach during a period of half an hour to an hour. The aggregate indicated power for mechanical driving thus obtained amounted to something over 500 horse-power. Cards were taken from the same engines in order to find the power necessary to drive the line shafting, countershafts, jackshafts and all other apparatus which ordinarily ran when no operating machine or crane was at work. It was found that this frictional horse-power was considerably over one-third of the amount found by taking the maximum for each engine, as stated above, when operating the machinery. Cards taken covering a considerable period of time show that in each case the power required of the engine was much less as an average from morn-

ing till night than obtained for the maximum load. While no actual calculations were made to determine the ratio of the frictional horse-power to that for this average load, it was very clearly shown that the indicated horse-power of the engine for average load was only about twice that for friction. Each engine drove its own system independently of the other engines. Other engines were used for generating currents for the electric cranes and a few electrically driven machines and sections of line shafting.

While the results of tests upon several electric motors convinced the writer that as high a degree of economy as is often set forth for such machinery could probably not be obtained in a commercial machine built to withstand heavy loads and rough service, he was certainly convinced that a great saving of the power wasted on friction in the mechanical transmission system could be saved by electric driving. It was found that electric motors, manufactured by well-known concerns who make the best of apparatus, required, for a 10 horse-power motor, about 1 electrical horse-power to run it without load, there being no belt upon the pulley, and when the only frictional resistance to be overcome was at the journals and brushes. The latter were adjusted to bear lightly against the commutator, which was smooth and otherwise in good condition. Under the same conditions a 20 horse-power motor required about 1.5 horse-power to drive it light, and a 25 horse-power motor required at one time 1.75 horse-power, but later, after the commutator had become slightly roughened by heavy overloading, it took fully 2 horse-power to run it light. Several other motors, of sizes ranging from 7.5 horse-power to 50 horse-power, showed similar demands for power to run them light. The motors were the products of several different manufacturers. The instruments used for taking the readings of current and pressure were of the Weston portable type, and were calibrated at the Weston factory during the test.

On one motor of 20 horse-power capacity it was noticed that the speed kept gradually increasing for some time after starting, until it became 5 per cent. or more greater than at first, although the line voltage and load remained constant, and no adjustment was made on any part of the motor or its attachments. The increase took place when the motor was completely left alone. After an hour or two the increase ceased, and the speed remained constant. The speeding up was probably due to weakening of the field magnets caused by the gradual heating of the field coils, and the reduction of field current by the increased resistance of the field circuit on account of its heating. Such an increase of speed was not noticed on other motors.

Although the writer has just stated what might, by mistake, be taken as objections offered by him to the use of direct current machinery, and might give opportunity to set forth the great advantages of synchronous and induction motors, which, on account of the absence of commutators and even collector rings in the latter type, do away with all the frictional commutator resistance, and, in addition, afford the utmost simplicity of construction, he wishes to affirm that he nevertheless believes the direct current machinery to be by far the most suitable for such cases as those in hand, although, on the other hand, he believes that there are many cases, especially when a uniform rate of speed is essential without speed variation governed by a controller between fixed limits, where alternating machinery is the one by far the most suitable. While we often hear of the faults and frailties of direct current machinery, it must not be forgotten that the direct current generator and motor were the pioneers in the field of the commercial application of electricity to lighting and power transmission, and that the tales of woe, true of the early machines, have a tendency to cling unjustly to the more modern direct current machinery, although it has been so improved as to free it from practically all the faults of its younger days and to make it as reliable and durable as the steam engine. Neither should it be forgotten that the alternating, and especially the polyphase, machinery, coming on at a later date, had advantage of all the knowledge gained through some years of costly experi-



ence with direct current machinery, and therefore does not have hanging around it any of the disagreeable reminiscences that are apt to follow the latter.

One great advantage of electric power transmission in the machine shop is that of having a means of furnishing power to portable machine tools, either large or small, at any part of the works where suitable circuits are run. It is such a strong point in favor of electrical transmission that it deserves being ever kept before the minds of those who have to do with machine shop and factory. The time that can be saved and the greater accuracy of work that can be secured upon many kinds of large machine members, by setting them upon a machined plane surface floor with slots and holes for inserting bolts to clamp them down, and then bringing portable machine tools to them with the crane, railway or truck, each to perform its own special operation, makes this method of procedure worthy of consideration by the manufacturer and builder of heavy machinery. The heavy casting can be set upon a flat metallic floor almost invariably more quickly than it can be set before any machine tool occupying a fixed location, and made ready for the tool to operate upon it. If the casting requires the operations of several kinds of machine tools, it must be set again and again, as many times as there are permanently located machines required to do the work. To set a portable machine tool with a plane machined base upon a level iron floor and bring into position for working upon a casting also upon the floor, occupies but a fraction of the time necessary for setting the casting in position for a permanent machine tool. Moreover, several portable machines may be brought into action upon one casting at the same time. This is seldom true of machines fixed in location.

### The Pacific Coast and the Interstate Commerce Commission.

SAN FRANCISCO, CAL., December 3, 1900.—Perhaps the most interesting matter in business circles to-day is the forthcoming meeting of the Interstate Commerce Commission at Washington, D. C., where it adjourned after the midsummer meeting in this city. The question of railroad transportation and the powers conferred on the commission by legislation in regard to it are now on trial, and whatever the decision of the commission may be there can be no doubt that the matter will ultimately find its way to the court of last resort—the United States Supreme Court. In this city on the occasion referred to the matter was fully gone into and evidence *pro* and *con* offered, and the proceedings in Washington will be the last act of the drama as far as the commission is concerned. I will not state my opinion as to what that decision may be, although I have formed very strong notions on the subject, but I will say, as far as the evidence went, it was entirely in favor of the stand taken by the railroad and the commercial organizations of this coast. The whole system of internal transportation is now on trial and transportation is the leading factor in the commercial world of to-day. It dictates where great commercial cities shall be built and, in many instances, removes forever the old landmarks of commercial empire. Can transportation companies and their customers agree as to the terms that are mutually advantageous? Can a less rate be charged for hauling a longer distance by rail when there is active competition by sea? Must freight rates be *pro rated* according to distance? These are the questions to be answered. The railroad and the business people of the Pacific Coast and the manufacturers of the Atlantic States say yes. The jobbers of Chicago, St. Louis, &c., say no. The latter are making a great fight to establish as a principle of freight charges rates graded according to distance from the point of shipping, irrespective of quantities shipped—this with some unimportant modifications, which said modifications are not antagonistic to the interests of the Middle West, is what they are fighting for. They take no account of the fact that the Pacific Coast has the benefit of sea competition. It is on this factor—namely, competition by sea—that the railroad principally bases its case, and it is on having the ad-

vantages that this factor gives them that the merchants of the Pacific Coast unfalteringly insist. Graded rates would so increase rates that Atlantic Coast manufacturers could not hold the Pacific Coast markets by rail, while Middle West jobbers would, as far as interior trade is concerned, drive the Pacific Coast merchant to the wall. The latter cannot be driven to the wall in this way, hence the railroads would suffer. Ocean competition is every day becoming more and more of a controlling power in this trade. We will soon have several 8000-ton steamers, and two 12,000-ton steamers for it are being built in this city. The "Sierra," a 6000-ton steamer, made the voyage to this city in 39½ days. Then the Panama Railroad is putting on a line of steamships in opposition to the Pacific Mail, so that the railroads would have a hard time of it in any event, and as the Middle West jobbers cannot drive the steamships off the ocean nor regulate their freight charges by law, it is hard to see what they can hope to accomplish in the event of success.

The representatives of the railroad and the Pacific Coast jobbers are now on their way East. They include J. C. Stubbs, one of the vice-presidents of the Southern Pacific, who made such a brilliant defense of the railroad's position at the session in this city; Wakefield Baker of the firm of Baker & Hamilton, president of the Pacific Coast Jobbers and Manufacturers' Association; H. D. Loveland, their traffic manager, vice-president of Lillmann & Bendel Company; A. C. Rulofson of Baker & Hamilton, who made such an able presentation of the Pacific Coast jobbers' case at the session already referred to; J. S. Pillsbury, associate counsel and others. For the time being the proceedings of the Interstate Commerce Commission at Washington take precedence of everything else in commercial circles on the coast, whether in the metal trades or otherwise.

J. O. L.

**Drawbacks on Imports.**—The Bureau of Statistics has published elaborate tables showing, for the fiscal years ending June 30, 1899, and June 30, 1900, the amount of drawback paid by the United States on imported articles withdrawn from warehouse. The movement is of little importance, except in a few articles, conspicuous among which, of course, is tin plate. The following are the figures:

	Drawback on Tin Plate.	
	Fiscal year 1899.	Fiscal year 1900.
Quantity, pounds.....	122,906,682	125,269,156
Drawback .....	\$1,792,322.02	\$1,867,516.83
Retention .....	\$17,922.47	\$18,724.68
Drawback paid.....	\$1,774,399.55	\$1,848,792.15

In lead there were withdrawn from warehouse, in 1899, 3966 tons of lead in ore, the drawback paid being \$132,196.06, while in 1900 the quantity was 593 tons, \$18,191 being paid. On lead in pig and bullion the 1899 quantity was 1940 tons, with \$64,593.34, while in 1900 it was 4864 tons, with \$130,488.70 paid as drawback.

**The English Westinghouse Structural Contract.**—English manufacturers of structural steel have rather prided themselves upon the fact that they carried off the contract for the material for the new shops which are building at Manchester for the British Westinghouse Electric & Mfg. Company, Limited, involving about 12,000 tons of steel. The chairman of the company, Hon. R. Clere Parsons, at the first annual meeting made this statement: "We are certainly behindhand in the completion of our works, and that has arisen in this way: That in the first instance we were most anxious to place the order for the steel work and other portions of the work in this country instead of placing it in America. We issued invitations to the large American firms and also simultaneously to the larger firms in this country, and we found there was a difference in point of time of about four or five months, the Americans being the shorter. We thought, on the whole, that under the circumstances it was advisable that the order should be placed in this country, and for this purpose it was placed with Dorman, Long & Co. of Middlesbrough—that is, for the larger portion of the works."

# The Iron Age

New York, Thursday, December 13, 1900.

DAVID WILLIAMS COMPANY,	- - - - -	PUBLISHERS.
CHARLES KIRCHHOFF,	- - - - -	EDITOR.
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RICHARD R. WILLIAMS,	- - - - -	HARDWARE EDITOR.
JOHN S. KING,	- - - - -	BUSINESS MANAGER.

## Rectification of the Currency.

There is a good prospect now that after wandering 40 years in the wilderness of a bad currency system the nation will emerge into the long promised land of rational finance. At the present short session of Congress the finances will receive no consideration. But the President and the Secretary of the Treasury have committed themselves, and, so far as they can, their party, to the completion of the work of establishing the single gold standard, begun last March, and the provision of an elastic and adequate bank currency. The latter can only be done by substituting other security, presumably the general commercial assets of the bank, for the Government bonds which the banks were required to buy because it was vitally necessary to the Government to sell them.

The Congress elected last month will meet a year from this time and most of its work will be done in 1902. It was in 1862 that the legal tender act was passed, which has been the cause of all the bad currency legislation and most of the dangers to the monetary standard since. There is not yet any promise of the redemption of the silver dollars and their sale for bullion. But with the gold dollar declared the only standard of value, and all Government obligations payable in it, the silver dollars could be left pretty safely to take care of themselves. Nor is there any promise of the retirement of the legal tender notes, but if the bank currency were freed from the limitation imposed by bond security, if their issue depended on the commercial demand for currency rather than on the income from Government bonds, their volume would increase till Government paper could be retired without fear of contraction.

In the meanwhile much has been accomplished. The currency expanded \$77,000,000 under the influence of the modifications of the national bank law made in March. The expansion came in the spring and summer, when additional currency was little needed, and almost none of it has occurred during the fall, when the handling of the crops calls for more money than at other seasons. Most of this currency once out will stay out, though in the winter there is a reduced need of currency. The total volume is only about half the bank capital. So the volume cannot be regarded as adequate, and it possesses scarcely any elasticity. But the increase has afforded real relief, and the small banks, only about half of which are new institutions, the other half having already existed as State and private banks, have done considerable to meet the necessities of sections poorly supplied with banks and currency. The maintenance of the gold standard has been so far assured that gold will readily come here from Europe if the pressure becomes great.

We have not had such a period of stringency as we had last year at this time, the reason for which is wholly or in great part the legislation of last March. We are assured this winter of a reduction of \$30,000,000 or \$40,000,000 of taxes, the removal being effected at the points of greatest friction, and we have reason to believe that

the next Congress will make all Government obligations payable in gold, and permit the banks to lend their capital to their customers instead of requiring a part of it, as a condition of issuing notes, to be loaned to the Treasury.

## Technical Education for Ambitious Mechanics.

The intention announced by Andrew Carnegie of founding a technical school in Pittsburgh has been published with appropriate comment. The opportunity is so seldom presented of suggesting the basis on which such an institution should be begun, and the lines along which its development should be directed to attain the largest measure of usefulness, that we venture some unsolicited opinions as to what, in our judgment, is most needed at the moment in our national educational system.

Our technical colleges are, in the main, admirable. For those who can give the time and afford the expense of acquiring the education they have the facilities for imparting, and who want such an education, they leave nothing to be desired. As the rule their entrance examinations can be passed only by those who are fresh from an academic course, more complete in everything except Latin and Greek than the college course of 25 years ago. The constant advance in their standards of graduation requirements, entirely proper and commendable from the pedagogic view point, steadily restricts their usefulness for students of limited capacity and circumscribed opportunities. This also is as it should be, no doubt. The world needs professors, specialists and original investigators in every department of science, and the machinery for producing men available for such services is as necessary as that of West Point and Annapolis. But it also needs much larger numbers of self educated, practical men, who could not write text books, perhaps, but who know how to use them and how to apply the information they contain in the thousand operations of the mill, factory, drafting room and mine. The world needs chemists who can make the most accurate analyses and to whom no composition of matter is an insoluble mystery; it also needs a great many more men who can draw from such analyses useful, practical deductions, and give them the applications which make for progress in the arts. It needs mathematicians who can weigh the stars as in a balance, and calculate the most intricate relations of masses and forces; but for one man with these capacities and attainments it needs a million men who can use mathematics as a means to an end, and of every one of whom it may be said, as a writer in the *Engineering Magazine* aptly puts it: "Small value will it be to him to be able to rectify well-known curves by the use of calculus, for example, if he does not know what he wants the curve for, or cannot apply the knowledge after he has got it."

With the average boy who passes from the high school or academy to the college or university, technical education is gained in perfunctory compliance with the decision of parents or guardians that it is the proper thing to take. Among this large number are some who cannot assimilate the strong food of knowledge these offer, and are dropped out at the periodical examinations; a still larger number work through to the end with a half comprehension of what they are studying, and are graduated without fitness for successful work in any line; some illustrate the parable of the seed in good ground, and are fitted for success in any profession which may be open to them. This was always true of the higher education, and probably always will be—at least for as long a time as men are constituted with dif-



ferent capacities and with varying temperaments and bents.

But our technical colleges, however excellent, do not meet the requirements of a large and growing class of young men to whom life presents itself in very practical aspects from the outset. They lacked the opportunities for good elementary education, having had to go to work when most boys more fortunately situated are in school. They recognize their limitations, and are practical enough to see that the lack of education is a handicap which only genius can overcome, and even genius only under favorable conditions. An ambition which finds itself confronted by an impassable barrier breeds discontent and unfits the young man for the only honorable sphere he is able to occupy. He does not have a recourse to the expedient of self-education. Between him and the beginning of technical knowledge there is a great gulf fixed which he finds impassable. As the writer before quoted very truthfully says: "In many text-books, mathematical formulæ and demonstrations are purposefully used to display the author's erudition, rather than to furnish the pupil with a mastery of one of the most powerful tools ever devised to aid the mind in its conquest of matter." This is especially true when the young mechanic, with a yearning for admission to the arcanum of a knowledge which will fit him for advancement, buys the books he sees recommended and tries to master them. They presume more general information than he possesses. Genius may burn its way through adamant; average talent and ordinary ambition are commonly discouraged at the outset and the effort of self-education usually ends in a struggle with insuperable initial difficulties. The text books which would bridge the chasm are yet to be written, and it is safe to say they will never come from the colleges.

Time is an element which cannot be overlooked by the class of young men referred to. For most of them it is impossible to prepare for and take a college course. Occasionally a young man does it, supporting himself meanwhile by outside work; but these exceptions only prove the rule. Men who have lost their arms have in some instances acquired marvelous dexterity with their toes, but out of a million armless men the proportion of those practically helpless would be very large. For the young man who, without other resources than his strength for an honest day's work, has begun to learn a mechanical trade and wants to become well informed and fitted for a position above the bench, self education has well defined limitations which those more fortunately situated do not appreciate. Ordinarily, it is impossible for him to give four years to a course of study, and if the way to do this was made clear to him, it is a question whether it would be in the largest sense advantageous. In officering the great industrial army we need something besides engineers, staff officers, signal corps specialists and the like. We need lieutenants, captains the higher officers of the line, and such positions can be most successfully filled by promotions beginning from the ranks, when the right men are found.

What we need most in our educational system is technical schools in the industrial centers which meet the requirements of this class of young men we have described. To be entirely successful, such schools must be conducted by men of broader views and sounder practical judgment than are usually found associated with high scholarship and ripe pedagogic experience. The professional teacher has, as the rule, no conception of what such a school of applied mechanics should be. He deems it his duty to teach the pupil what books contain, rather than to show him how to use books and

to avail himself of the rules, tables, formulæ and deductions which are the keys to unlock every closet in the storehouse of knowledge. He wants to make the pupil an expert in laboratory manipulations, which he should be if his elected career is that of an analytical chemist; but cannot understand that for any one else it is less useful to be able to make the analysis than to know what the analysis means when made. In mathematics the professional tendency is to prepare the pupil for detail work which has already been better done before, rather than to show him how to use the convenient means of every engineer's handbook to get the results he needs. In every branch of science the pedagogic standard is ability to conduct original investigations; in practical work, which is a failure if not pecuniarily profitable, the capacity for rapid and accurate generalization from available data is worth a great deal more. In a word, the knowledge of how to use books is what the great mass of technical students with a purpose in life most need. There will always be plenty of book makers. The schools which impart this knowledge most successfully will be those conducted by broad minded business men with the assistance of teachers who are not ambitious of professional chairs in the universities, and are perhaps unfitted for them.

The work of the Cooper Union in New York places it in some respects at the head of the educational foundations of this country for practical usefulness. Many other institutions organized on similar lines merit honorable mention. But there are not nearly enough of them. Practical philanthropy which chooses this line of usefulness will probably do more good and contribute more to the industrial progress of the country than if directed in any other channel.

### The Tendency to Concentration.

The inevitable result of improved means of intercourse is the concentration of business. The remarkable growth of many of our cities and towns, as shown by the figures of the recent census, is due less to the sentimental desire of dwellers in the country to secure certain advantages of urban life than to the tremendous strides which have been made in cheapening and improving local transportation. The large cities have greatly improved all their facilities for handling freight and passengers and have in almost every instance made a much more extensive area tributary to their manufacturers and merchants. The smaller cities have gained heavily through the building of electric railroads traversing the surrounding country and enabling the residents of the rural districts to cheaply and conveniently secure the opportunity to trade with town merchants. Thus the urban mercantile establishments have greatly increased their business, carrying with the increase much benefit to related branches of trade and swelling the resident population. The suburban or rural merchant has suffered through the diversion of much of his trade to the city or town merchant, who a few years before was not even remotely regarded as a competitor. In notable instances an entire county has been thus brought into easy communication with one town lying within it, whose business men have perceived the benefits to be derived from building trolley lines radiating to all points of the compass. The town has grown bigger through the impulse thus given to its business interests, even though no large manufacturing enterprises located there.

The improvement of other means of intercourse, such as the extension of cheap express service and the betterment of mail facilities, tends to the same end of business

concentration. The rural merchant or the small manufacturer in an out of the way place is getting better service steadily and can carry less merchandise or materials in stock to supply his needs, but at the same time his customers are also participants in the same direction and are given enlarged opportunities to trade with distant merchants or manufacturers. Every improvement made in the postal or express service strengthens this tendency toward concentration of business. The system of free rural postal delivery and its accompaniment of increased facilities for transmitting small amounts of money through postal orders will undoubtedly operate powerfully in this direction, as will the proposed enlargement of the limit of weight of mailable merchandise, should that be done.

The problem of combating this tendency to concentration of business is a very serious one to rural merchants and small manufacturers. To remove to more central points and compete for enlarged trade involves perhaps considerable sacrifices of property interests and the investment of much more capital. To continue as heretofore means to fight more vigorously for local trade and study methods by which old customers can be retained. The situation, however, is one which is full of warning to those who contemplate engaging in business as merchants or manufacturers. If they have the necessary qualifications of fitness, capital, energy and experience, there is no reason why these qualifications should not be as successful in building up a lucrative business in the future as at any time in the past. But never before has it been so necessary for the advantages or disadvantages of location to be carefully studied, if the projector of a commercial or manufacturing enterprise expects to do more than eke out a bare living in supplying the most pressing wants of the vicinage. The tendency to concentration is not one to be deplored but to be recognized. Those who are the most ready to grasp its advantages and utilize them will find them better aids to rapid business development than the methods they displace.

**A New Open Hearth Plant.**—The Reading Iron Company of Reading, Pa., have decided to build an open hearth steel plant. As yet, however, no particulars have been agreed upon, nor have any contracts been entered into. It is reported that a blooming mill and skelp mills are likely to follow.

**Cold Rolled Shafting.**—A meeting of the Cold Rolled Shafting Manufacturers' Association was held in Pittsburgh on Thursday, December 6, all the mills in the association being represented. In view of the heavy demand for shafting, and the advancing tendency in prices on other lines of product, it was decided to make a further advance in price of shafting to 57 per cent. off in carload lots and 52 per cent. in less than carloads, delivered in base territory. Former prices were 60 per cent. in carload lots and 55 in less than carload lots.

**A New Sheet Mill.**—The Parkersburg Iron & Steel Company of Parkersburg, W. Va., have decided to build a sheet mill.

The Blyth River Iron Company who own an iron ore deposit in the north of Tasmania, are considering the question of building a steel plant in New South Wales. J. H. Darby of Urexham is the consulting engineer, the headquarters of the Australian company being at 31 Queen street, Melbourne.

The Atlanta Metal & Bottle Company, Atlanta, Ga., have bought ground fronting on the Georgia Railroad on which they will erect the necessary buildings for the carrying on of their business as handlers of paper stock, scrap iron, rails and metals. Their yard is about an acre and a half, with track running through it.

## The Foundrymen's Association.

The one hundred and third regular meeting of the Foundrymen's Association was held at the Manufacturers' Club, Philadelphia, Pa., Wednesday evening, December 5, President Thomas I. Rankin occupying the chair. There was a large and representative attendance present, among whom may be mentioned:

Thos. I. Rankin, Abram Cox Stove Company, Philadelphia.  
James E. Stirling, Harlan & Hollingsworth Company, Wilmington.  
James A. Taylor, Cramps' Brass Foundry, Philadelphia.  
J. Jones, Wm. Cramp Ship & Engine Company, Philadelphia.  
A. G. Warren, J. W. Paxson Company, Philadelphia.  
Jones Wister, L. & R. Wister & Co., Philadelphia.  
Jno. Dickson, Penn Steel Casting & Machinery Company, Chester.  
Alfred Belfield, H. Belfield & Co., Philadelphia.  
S. G. Flagg, Jr., S. G. Flagg & Co., Philadelphia.  
Walter Stevenson, Thomas, Roberts, Stevenson Company, Philadelphia.  
Thos. Maher, D. S. Creswell, Philadelphia.  
G. Marsh, S. Baltimore Foundry Company, Baltimore, Md.  
Geo. A. Messick, Pusey & Jones Company, Wilmington, Del.  
John L. Neave, Pusey & Jones Company, Wilmington, Del.  
C. S. Koch, Wm. Sellers & Co., Philadelphia.  
P. C. Van Fleet, I. A. Sheppard & Co., Philadelphia.  
Geo. C. Davis, chemist, Philadelphia.  
Chas. K. Davis, Crown Smelting Company, Chester, Pa.  
F. H. Finlay, Barnard & Leas, Moline, Ill.  
Aug. Williams, Enterprise Mfg. Company, Philadelphia.  
A. A. Miller, *The Iron Age*, Philadelphia.  
F. C. Price, E. J. Etting, Philadelphia.  
A. J. Wright, Abram Cox Stove Company, Philadelphia.  
W. E. Arnold, L. & R. Wister & Co., Philadelphia.  
C. H. Newcomb, Matthew Addy & Co., Philadelphia.  
C. D. Matthews, Camden Iron Works, Camden, N. J.  
E. A. Hoffman, Hoffman Hardware Company, Los Angeles, Cal.  
F. H. Thomas, Los Angeles, Cal.  
J. S. Hibbs, J. W. Paxson Company, Philadelphia.  
Howard Evans, J. W. Paxson Company, Philadelphia.  
Antonio C. Pessano, Geo. V. Cresson Company, Philadelphia.

The Executive Committee made a report on the matter of the Foundrymen's Association laboratory, by which Geo. C. Davis, chemist, was allowed to use the name of the association in establishing a chemical laboratory, and in return for which members of the association would obtain a special discount on chemical analyses or other work performed (full report of this was published in *The Iron Age*, November 15, 1900). At the conclusion of the report Mr. Davis, on request of the chair, announced that the laboratory would be open for business by December 15, 1900, and would be located at 39 South Tenth street, Philadelphia, Pa.

Under new business the Executive Committee stated that they had taken up the matter of the incorporation of the association. This matter was, however, dropped, in view of an opinion by Chapman & Chapman, attorneys, which brought out the point that it would be impossible for the association to obtain a charter under its present constitution.

Paper for the evening's programme was by E. H. Putman, Moline, Ill. Subject, "Shot Iron. How to Recover It, and How to Use It," and a description of the Barnard & Leas magnetic separator. In the absence of Mr. Putman, F. H. Finlay, Moline, Ill., read the paper and took part in the discussion of same, and gave necessary information in relation to the magnetic separator. Samples of separated shot iron of various sizes were shown. The paper is as follows:

### Shot Iron. How to Recover It, and How to Use It.

In most foundries there is going forward a constant and heavy waste of iron, day by day, year after year, while strange as it may seem the founder is in many cases totally unconscious of the fact; and those who realize that there is a waste are in entire ignorance of its magnitude. We have been taught that the small particles of iron that escape from the tumbling mill and are thrown out with the refuse are not, in any true sense, waste; for, it is claimed, this iron is of no real value, as it will not mix, and it has a hardening effect upon the mixture.

I have recently learned that there is a much greater quantity of iron thrown away than I had suspected, and that, though it does harden the mixture to some extent, this is not sufficient to preclude the possibility of its economical consumption. I am aware that some



writers on foundry practice aver that there is no economy in using it; that, as noticed above, it hardens the mixture and that, also, much of it is burnt up and so destroyed. While it is quite probable that some of the very thin, light particles are indeed consumed in the remelting, it is, nevertheless, certain that the greater part melts and mixes with the other iron. This I know, for I have tested the matter by melting a quantity by itself, weighing it into the cupola and afterward weighing the product, the latter being 90 per cent. of the amount charged. The shrinkage in some kinds of pig iron will equal this.

Our method is as follows: We pass the cupola cinders through the tumbling mill (as has always been our custom), continuing the tumbling until the cinders are thoroughly crushed and everything but the iron has sifted out between the staves, which in our practice fit rather closely for the purpose of saving as much iron as possible by this process.

Now the refuse dust and fine cinder which formerly was dumped out as being entirely worthless is passed through the magnetic separator; and the amount daily recovered from the dump of two cupolas is something in excess of 550 pounds of iron, which will yield 500 pounds after sifting, or 450 pounds after remelting. The product when melted by itself is a strongly mottled pig. But as this shot iron is distributed throughout the heat as mixed in the daily cast, its hardening effect is very slight, and, in a well ordered mixture, cannot be detected in any but very light, thin castings.

But you cannot use this shot iron in all mixtures any more than that you can use certain pig irons in all mixtures. If you are going to use the shot iron regularly the pig mixture must be regulated with this fact in view.

When we first began using this shot iron we had some No. 2 soft charcoal iron which we were using in the regular soft iron mixture, and we had no trouble whatever. Later the charcoal iron having been all consumed we made a mixture of all coke iron, employing, of course, the usual quantity of scrap (50 per cent., which includes our shop remelt), with the result that the light castings were altogether too hard for drilling. There were but few of these castings made, and they were thrown into the scrap.

In the process that I now immediately began and prosecuted to a conclusion may be seen the method of a branch of the "rule of thumb" foundry practice.

The shot iron was left out entirely and the balance of the mixture made as before. A few of the light castings only were made, and these were cast at different parts of the heat. Result, too hard for the light castings that had to be drilled, but all right for the balance. There were three different numbers of pig iron in the mixture—viz., No. 2 soft, Southern; No. 2 foundry, Southern, and No. 1 Northern. The two former were from an unfamiliar furnace. So the per cent. of No. 2 foundry was diminished with good result. Cutting down of the No. 2 foundry was continued until that brand was entirely eliminated, and even then the product was not so soft as to enable the use of the shot iron in the light castings. During the process we had also changed the per cent. of No. 1 iron in the mixture to correct shrinkage. The loss consequent upon the "rule of thumb" method of correcting our mixture would amount, in money, to very little.

Now we omitted the shot iron from the first 7000 pounds charged in the cupola, which enabled us to cast the light work before the mixture containing the shot iron came down.

As the No. 2 foundry iron was too hard for our use, except in the heavier castings, we bought from a different furnace; and now we are again using the shot iron without difficulty.

We have had no difficulty consequent upon the use of the shot iron, except in the matter of hardness. To overcome this it is only necessary to use a sufficiently soft pig iron in the mixture. We have not been obliged to use any specially soft iron in the mixture—just ordinary No. 2 soft, No. 2 foundry and No. 1 foundry—the same brands that we were using before we began melting the shot iron.

The actual saving in our case is, say, 450 pounds of iron per day, at 67 cents; \$3 per day.

The time consumed in operating the separator must be considered, of course; but this is so trivial that no additional labor is employed, the work of running the separator having been added to the duties of the laborers who work about the cupola.

The magnetic separator that we use is one that Barnard & Leas of Moline, Ill., invented and perfected during the past year, and which they are now manufacturing for the trade. I do not wish to make any invidious comparisons between this machine and other machines manufactured for the like purpose; however, a general description of it may not be out of place.

The machine is essentially in shape a cylinder, wound with copper wire which, in operation, is charged with electricity. This cylinder is set in the frame at an incline that will cause the cinders to pass through from the one end where they are charged out at the other, the magnetized inner surface of the cylinder catching and holding fast every particle of iron. It might seem at first thought that some of the iron particles would get brushed out with the dust and coke cinders; but it should be borne in mind that the iron in contact with the cylinder is itself magnetized, and therefore holds firmly any iron that comes in contact with it. When the current is thrown off the iron lets go from the cylinder and pours out into the receptacle. The work of operating this machine is as simple and easy as running a power sand sifter. Cost of current for the machine is less than 2 cents per hour, and one hour's labor will run the day's product through.

The machine weighs about 1100 pounds, and occupies a floor space of 3 x 8 feet.

In conclusion I wish to state that the saving effected by us is less, by a good deal, than what it would be in foundries where extraordinary care is not taken to extract the iron from the cinders by having close fitting staves in the cinder mill. In fact, it is quite obvious that, in view of the difference in the care taken in various foundries in this respect, the saving by the use of the separator in some foundries would be two or three times what it is with us.

One very important point to bear in mind is that no matter how large or how small the pieces of iron, none can escape the vigilance of the machine. So that if the operator of your cinder mill becomes careless, permitting wide spaces between the staves, which will pass large pieces of iron that would ordinarily go to the dump, the magnetic separator will catch this iron and save it for you.

It is our intention to provide wider spaces between the mill staves, so as to obviate the necessity for so much grinding in order to reduce the cinder. This will save somewhat of time and wear of machinery without any loss of thoroughness in the extraction of the iron.

Messrs. Pessano, Flagg, Williams, Evans and others took part in the discussion, after which the association on motion of Mr. Davis adjourned. The members and visitors then proceeded to the roof garden of the club, when luncheon was served. President Rankin, acting as toastmaster, introduced with a few well chosen remarks F. H. Thomas of Los Angeles, Cal., who made a short address. E. A. Hoffman, A. J. Wright, Antonio C. Pessano and J. S. Stirling were also called upon, and each made a few remarks, after which the social session came to a conclusion.

**The Niles Iron & Steel Company.**—The Niles Iron & Steel Company, organized at Niles, Ohio, recently, have elected the following officials: James Patterson, president; H. M. Robinson, vice-president, and W. A. Thomas, secretary and treasurer. Mr. Patterson was also made superintendent. He was formerly manager of the sheet mill of the Struthers Iron & Steel Company, at Struthers, Ohio, before it was taken over by the American Sheet Steel Company. The new concern propose to erect a three-mill sheet plant at Struthers. The main structure to be 124 x 200 feet, of steel frame, and covered with corrugated sheets. The building will be commanded by a 15-ton electric crane, and the company will also have their own electric plant.

# Pig Iron Production Increasing.

## Stocks Declining Sharply.

We present below the details which indicate quite clearly how consumption has overtaken current production, so that quite a material reduction in the stocks has taken place in spite of a moderate increase in the output. It is well known that preparations are going forward in a number of quarters to further increase the output.

A considerable number of coke and anthracite furnaces started during November. Among them we may note B Niagara furnace, Atlantic and Spearman in the Shenango Valley; Rebecca, in Western Pennsylvania; the third Lackawanna, at Scranton; Franklin and Steelton in Ohio, New York in the Hocking Valley, one Bay View in Wisconsin, America and Haselton in the Mahoning Valley, one of the Sheffield furnaces of the Tennessee Company in Alabama, Victoria in Virginia and No. 1 Ashland in Kentucky.

Among those which blew out for repairs were Buffalo, Saucon, Punxy, Bellaire, in the Wheeling district, and Etna, in the Hanging Rock region.

The weekly capacity of the furnaces in blast on December 1 compares as follows with that of the preceding periods:

	Furnaces in blast.	Capacity per week. Gross tons.
December 1, 1900.....	211	228,846
November 1.....	201	215,804
October 1.....	213	223,169
September 1.....	228	231,778
August 1.....	240	244,426
July 1.....	284	289,413
June 1.....	203	206,376
May 1.....	202	203,850
April 1.....	201	200,482
March 1.....	203	202,643
February 1.....	206	208,014
January 1.....	200	204,186
December 1, 1899.....	203	206,959
November 1.....	277	288,522
October 1.....	265	278,650
September 1.....	257	267,385
August 1.....	244	267,672
July 1.....	237	263,363
June 1.....	220	251,062
May 1.....	217	250,095
April 1.....	205	245,746
March 1.....	192	228,195
February 1.....	195	207,639
January 1.....	200	243,516
December 1, 1898.....	195	235,528
November 1.....	196	228,935
October 1.....	192	215,635
September 1.....	186	213,043
August 1.....	187	206,777
July 1.....	185	216,311

## Charcoal Furnaces in Blast December 1, 1900.

Location of furnaces.	Total No. of stacks.	No. in blast.	Capacity per week.	No. out of blast.	Capacity per week.
New England.....	7	3	286	4	360
New York.....	12	12	174	0	0
Pennsylvania.....	13	12	123	11	500
Maryland.....	4	1	86	3	340
Virginia.....	3	12	90	1	80
Ohio.....	6	4	204	2	160
Kentucky.....	2	0	0	3	200
Tennessee.....	7	4	1,151	3	320
Georgia.....	4	12	609	2	230
Alabama.....	5	4	1,232	1	100
Michigan, Missouri and Wisconsin.....	12	7	2,612	5	2,988
Texas.....	4	1	122	3	775
Totals.....	70	32	6,779	38	6,153

As compared with previous months the record of active charcoal furnaces stands as follows:

	Furnaces in blast.	Capacity per week.
December 1, 1900.....	32	6,779
November 1.....	30	7,923
October 1.....	31	8,243
September 1.....	31	8,227
August 1.....	31	8,295
July 1.....	32	8,492
June 1.....	27	7,605
May 1.....	25	6,894
April 1.....	29	7,838
March 1.....	29	7,047
February 1.....	32	8,004
January 1.....	30	7,457
December 1, 1899.....	30	7,511
November 1.....	29	7,113

October 1.....	25	6,222
September 1.....	24	5,665
August 1.....	22	6,189
July 1.....	20	6,018
June 1.....	16	4,943
May 1.....	16	4,846
April 1.....	17	4,777
March 1.....	16	4,330
February 1.....	17	4,967
January 1.....	19	6,036
December 1, 1899.....	18	6,018
November 1.....	19	5,947
October 1.....	20	5,732

The condition of the coke and anthracite furnaces at the beginning of the month was as follows:

## Coke and Anthracite Furnaces in Blast December 1, 1900.

Location of furnaces.	Total No. of stacks.	No. in blast.	Capacity per week.	No. out of blast.	Capacity per week.
New York.....	15	2	2,527	13	8,857
New Jersey.....	8	3	1,774	5	885
Spiegel.....	3	3	484	0	0
Pennsylvania:					
Lehigh Valley.....	20	15	8,537	14	5,454
Spiegel.....	1	1	80	0	0
Schuylkill Valley.....	14	8	6,450	6	2,590
Upper Susquehanna.....	4	3	2,733	1	336
Lower Susquehanna.....	9	3	3,918	6	2,586
Spiegel.....	1	1	224	0	0
Lebanon Valley.....	13	5	4,288	8	7,155
Pittsburgh District.....	36	25	58,093	5	8,766
Spiegel.....	1	1	1,115	0	0
Shenango Valley.....	15	7	10,106	8	7,708
Western Pennsylvania.....	21	9	12,848	12	8,048
Spiegel.....	1	1	459	0	0
Maryland.....	4	2	5,074	2	2,675
Spiegel.....	1	1	403	0	0
Wheeling District.....	8	5	7,271	3	4,095
Ohio:					
Mahoning Valley.....	14	7	16,647	7	9,438
Central and Northern.....	13	9	13,382	4	8,036
Hocking Valley.....	2	1	609	1	200
Hanging Rock.....	14	5	2,832	9	3,486
Illinois.....	17	11	22,294	6	5,675
Spiegel.....	1	1	860	0	0
Minnesota.....	1	0	0	1	763
Wisconsin.....	5	2	2,222	3	2,456
Missouri.....	1	0	0	1	570
Colorado.....	2	2	2,348	0	0
The South:					
Virginia.....	18	13	7,775	5	3,219
Kentucky.....	5	2	743	3	1,720
Alabama.....	38	23	30,449	15	9,234
Tennessee.....	14	8	5,522	6	2,927
Georgia.....	1	0	0	1	450
North Carolina.....	2	0	0	2	437
Totals.....	336	179	222,067	147	107,761

In comparison with previous months the record of the coke and anthracite furnaces stands as follows in gross tons:

	Number in blast.	Capacity per week.
December 1, 1900.....	179	222,067
November 1.....	171	207,381
October 1.....	182	214,921
September 1.....	197	223,551
August 1.....	209	236,131
July 1.....	252	274,921
June 1.....	205	228,771
May 1.....	207	226,956
April 1.....	202	221,644
March 1.....	204	225,596
February 1.....	204	200,010
January 1.....	250	226,729
December 1, 1899.....	253	229,448
November 1.....	248	221,409
October 1.....	241	272,428
September 1.....	223	261,670
August 1.....	222	261,483
July 1.....	217	257,345
June 1.....	204	249,119
May 1.....	197	245,249
April 1.....	188	240,969
March 1.....	175	223,865
February 1.....	178	222,672
January 1, 1899.....	180	227,490
December 1, 1898.....	177	229,510
November 1.....	176	222,988
October 1.....	172	209,908
September 1.....	165	206,750

## Furnace Stocks.

The position of furnace stocks, sold and unsold, as reported to us, was as below on December 1, the same furnaces being represented as in former months. This does not include the holdings of the steel works producing their own iron.

Stocks.	July 1.	Aug. 1.	Sept. 1.	Oct. 1.	Nov. 1.	Dec. 1.
Anthracite and Coke.....	387,482	460,824	575,713	608,587	573,952	493,702
Charcoal.....	33,556	43,517	49,444	61,944	67,514	62,934
Totals.....	421,038	504,341	625,157	670,531	641,466	556,636

## Warrant Stocks.

The American Pig Iron Storage Warrant Company report the following stocks:

Stocks.	July 1.	Aug. 1.	Sept. 1.	Oct. 1.	Nov. 1.	Dec. 1.
Coke and Anthracite.....	4,400	12,000	20,000	20,300	18,500	17,400
Charcoal.....	1,400	1,800	1,800	1,500	1,500	1,400
Totals.....	5,800	13,800	21,800	21,800	20,000	18,800



## PERSONAL.

Henry E. Goodell has resigned from the presidency of the Greenfield Machine Company of Greenfield, Mass., and is succeeded in that office by Franklin E. Snow.

F. R. Hertzog of Cleveland, Ohio, has been appointed chief engineer of Tate, Jones & Co. of Pittsburgh, Pa., in charge of the recently established hoisting and conveying machinery department.

R. S. Greene, for some years traveling representative of N. & G. Taylor Company, Philadelphia, for northern Ohio, Michigan, Illinois and Iowa, will sever his connection with that firm at the close of the year. After January 1 he will represent McClure & Co., tin plate and metals, 211-213 and 215 Second avenue, Pittsburgh, and 115 North Seventh street, Philadelphia, in the same territory.

W. A. Rogers of the Tonawanda Iron & Steel Company, Buffalo, N. Y., spoke on behalf of the iron and steel interests at the hearing on the enlargement of the Erie Canal before Governor-elect Odell. Mr. Rogers stated that the Buffalo plants can ship seaboard for 85 cents by water, while the railroads charge \$2.40.

Herman Sielcken has resigned from the directorate of the American Steel & Wire Company.

Rudolf Dolge, special commissioner of the National Association of Manufacturers to Venezuela, and Dr. Alberto Smith, formerly Minister of Public Works of Venezuela, have arrived in this country for the purpose of placing contracts for structural steel and other building material, to be used in rebuilding the portion of Caracas destroyed by an earthquake on October 29. Among the contracts being placed are some for Government buildings and others for large business houses.

Sir Theodore Fry of Darlington, an ironmaster in the Cleveland district is now in this country.

Dr. David T. Day of Washington has returned from Paris, where he has been in charge of the exhibit of the Standard Oil Company.

Andrew Carnegie has offered to donate to the city of Chattanooga, Tenn., the sum of \$50,000 for a free library, provided the city authorities will appropriate \$5000 annually to maintain it.

Robert Hunter, who succeeded Garry LeVan as chemist at the Laura Furnace of the Republic Iron & Steel Company, at Haselton, Ohio, has been transferred to Hall Furnace of that concern, at Sharon, Pa., where he will be chemist under Mr. LeVan, who will blow that stack. Mr. Hunter has been succeeded by Frank Herst of New Jersey.

Henry Clay Frick has decided to erect a 20-story office building on a large site of land opposite the Court House on Grant street, Pittsburgh, which Mr. Frick recently bought. D. H. Burnham & Co. of Chicago will be the architects.

Frank McCune, who has been superintendent of transportation of the Monongahela Railroad at Pittsburgh, owned by Jones & Laughlins, Limited, has been promoted to assume additional duties, with the title of general superintendent. It is understood that Benjamin Page, now secretary and treasurer of the Monongahela Connecting Railroad, will sever his connection with the road when the new American Trust Company of Pittsburgh, in which he is largely interested, begins business.

John Bott, formerly master mechanic of the mills of the American Steel Hoop Company, at Youngstown, has been appointed chief engineer at the Brown-Bonnell plant of the Republic Iron & Steel Company, that city.

B. M. Barr, who for several years has been the New York manager for the Stirling Company of Chicago, manufacturers of water tube boilers, will sever his connection with the company on January 1.

**The Bonus System in Court.**—A decision bearing upon the molders' strike in Cleveland was made a few days ago by Justice of the Peace Bohm in the case of Michael Nugent vs. the American Shipbuilding Company. Nugent went to Cleveland from Boston, in com-

pany with several other non-union men, and was employed at the company's Globe shipyards. According to testimony the men entered into a contract whereby they were to receive \$2.75 per day and a bonus of \$2 per day providing they worked continuously for 60 days, were competent, and gave the employers no cause for their discharge. Every two weeks a bonus of \$1 per day was paid and \$1 per day was withheld until the expiration of the 60 days. Nugent worked 48 days and was discharged. His bonus of \$48 was not paid because the company claimed he had violated the agreement by becoming intoxicated and neglecting to work one day. He brought suit for the balance of the bonus and the Court rendered a decision in his favor, holding that the contract was faulty, inasmuch as it lay wholly with the company to decide upon its merits. The attorney for the defendants gave notice of appeal. It is said that other suits of a similar nature will follow.

## MANUFACTURING.

### Iron and Steel.

Work on the new pipe mills to be built by the Wheeling Steel & Iron Company, Wheeling, W. Va., will be pushed as fast as possible. The initial plant will contain one bell furnace and two lap weld furnaces. All sizes of pipe up to 10 inches will be made at the start and eventually up to 16 inches will be made. The Wheeling Steel & Iron Company are particularly well equipped for making pipe, as their own blast furnaces, Bessemer steel plant and skelp mills insure to them a low cost of material.

The Lickdale steel plant, Lickdale, Pa., has become the property of Samuel E. Light, and will be removed to Lebanon and operated in conjunction with the Lebanon Rolling Mill. The Lickdale plant was built by John H. Lick, a son of the founder of the Lick Observatory. When removed the plant is to be thoroughly equipped for the making of open hearth steel.

Zug & Co., Limited, Pittsburgh, makers of black sheets, have placed a contract with Mackintosh, Hemphill & Co. of that city for two more sheet mills, which will give this concern a complement of six mills. When the two new mills are completed Zug & Co., Limited, expect to turn out about 50 tons of sheets per day. The firm tore down 22 puddling furnaces in order to make room for the new sheet mills, but will continue to operate 22 other puddling furnaces and a bar mill, on which they make their high grade bar iron.

The forge and puddle department of the Crum Lynne Iron & Steel Company, Chester, Pa., started up last Monday, December 3. They will start their new finishing mill next week on sheared charcoal boiler tube skelp.

Work on the additional power plant at the rod mill of the Ashland Steel Company, Ashland, Ky., is being pushed as rapidly as possible. They are increasing their power by the addition of new and improved machinery, and expect to increase their output fully 50 per cent. by the middle of January. They have been running both their steel works and rod mill with natural gas since July 1.

The J. Painter & Sons Company of Pittsburgh have filed a petition in court asking for a decree of dissolution. It will be recalled that this concern were taken over by the American Steel Hoop Company.

The Pittsburgh Works of the American Tin Plate Company, at New Kensington, Pa., are still idle, with no prospects of early resumption. The Pennsylvania Works, also at New Kensington, are in operation and the work is divided between employees of both plants.

The Republic Iron & Steel Company have decided to dismantle old No. 1 puddle mill at the Brown-Bonnell Works, in Youngstown. The plant was originally built in 1865. The ground will be utilized for the building of an addition to the Brown-Bonnell Works.

Niles Furnace of the National Steel Company, at Niles, Ohio, which has been idle for some time, will blow in about January 1. The stack has been completely remodeled and considerable new equipment added. It is expected to turn out from 300 to 350 tons of Bessemer Iron every 24 hours.

The National Tube Company of Pittsburgh will make some extensive improvements to their McKeesport works, at McKeesport, Pa. Considerable ground now occupied by tenement houses will be utilized in making these extensions. The tenants have been notified to vacate. The seamless tube works of the National Tube Company, also in McKeesport, are to be considerably enlarged.

The Irondale works of the American Tin Plate Company, at Irondale, Ohio, are being arranged to roll very large roofing sheets. A new washhouse building, 80 x 100 feet, has been erected and four large dipping pots put in. Heretofore the largest sheets dipped were 32 x 38 inches, but with the new pots it is proposed to dip sheets 54 x 66 inches. It is probable

that more pots will be put in, providing the present ones work successfully.

Clinton Furnace of the Clinton Iron & Steel Company, at Pittsburgh, will be blown out before long, to be rebuilt and some modern appliances added. The stack will be made higher, a Kennedy skip added and considerable other additional equipment will be provided. It is expected to bring the capacity of the stack up to about 300 tons per day.

The new plant of the Empire Rolling Mill Company at Cleveland commenced operations last Friday. They will produce bar iron and steel.

Laura Furnace of the Republic Iron & Steel Company, at Youngstown, which was blown in recently, turned out in one day 321 tons of standard Bessemer iron. This is regarded as a large output for a newly blown furnace of the size of the Laura.

The American Sheet Steel Company's plant at Canal Dover, Ohio, commenced operations last week, after being idle for over four months. Three hundred men are employed.

A fire at the Cambridge, Ohio, plant of the American Tin Plate Company last Thursday destroyed the finishing departments, four sets of cold rolls, the pickling department and a warehouse filled with finished product. The machinery was considerably damaged and a number of cars on a siding were burned. The mills had just resumed after a long idleness.

### Machinery.

The contracts for the 26-inch billet mill and 18-inch billet mill to be built at the Bessemer plant of the Republic Iron & Steel Company, at Youngstown, Ohio, have been given to the Lloyd Booth Company of that city. Work on these new mills is being pushed as fast as possible.

M. Suber, formerly a manufacturer of bicycles at Niles, Mich., has removed to Michigan City, Ind., where he has rented a building formerly used by the Amazon Hosiery Company for the purpose of operating a machine shop.

The Winslow Bros. Company of Chicago are about to close a deal for a large factory situated in the outlying section of the city, in which they will manufacture elevators. It will be recalled that some years ago they went into the business of making elevators, but subsequently their ornamental iron business absorbed all their attention and they relinquished that industry. They are now about to organize a new company and go into the field upon a more extensive scale, and with that end in view have associated with them some of the experts who were employed by the Crane and Hale companies prior to their absorption by the Otis. They are already reaching out for orders and have secured over \$200,000 of contracts. Their operations are at present confined to the factory at 368 Carroll avenue.

The Paris agent of the Rand Drill Company reports that all the compressors and drills which were on exhibition at the exposition have been sold. The large Corliss compound compressor at Vincennes was purchased by the firm of J. & A. Niclausse, the manufacturers of the famous Niclausse water tube boilers, by whom it is to be used for the operation of pneumatic tools in their extensive establishment. This is the compressor which supplied the compressed air to all the American exhibits at Vincennes.

The Gelser Mfg. Company, Waynesboro, Pa., manufacturers of engines, boilers, &c., are building a boiler shop 100 x 200 feet; the construction is a steel frame filled in with brick. Their new shop will be equipped with traveling cranes and the most modern boiler making machinery, including an air compressor, a 350-ton hydraulic flanging press, a 100-ton hydraulic riveter, &c.

The Clark Bros. Company, Vicksburg, Mich., have incorporated, with a capital stock of \$20,000. The new company succeeded to the business of Clark Bros., manufacturers of steam specialties, and will add a brass and iron foundry to their plant in the spring. The officers are E. E. Clark, president; O. E. Clark, vice-president; W. A. Wood, secretary and treasurer.

The Louisville Foundry Machine Company, Louisville, Ky., have incorporated to do a general foundry and machine business and construct electric elevators. The capital stock is \$25,000, in shares of \$100 each, distributed among the following incorporators: John Dollinger, 40 shares; George Abell, 40 shares; Frank Dollinger, 10 shares; E. A. Richter, 10 shares; John Prinz, 10 shares; Godfrey Lips, 10 shares; William Feltman, 10 shares.

The Wheland Machine Works, Chattanooga, Tenn., are building a small addition to their foundry.

The Susquehanna Casting Company, Wrightsville, Pa., manufacturers of builders' hardware and iron castings, have just completed a brick addition, 110 x 30 feet, to their works. Increased business has compelled them to double the capacity of their foundry. Smith & Mead, Knoxville, Tenn., are their Southern representatives.

W. H. Greer, Pine Bluff, Ark., has purchased an interest in the Pine Bluff Iron Works. The company are fitting up a new machine shop in connection with their foundry and expect to have it in operation by February 1.

A fire occurred on November 16 at the works of the Portland Company, Portland, Maine, manufacturers of engines, boilers and general machinery, which destroyed the wooden addition

to their foundry. The building was completely consumed, with the flasks and patterns that were there at the time. The loss is under \$4000, which is fully covered by insurance.

A misleading report has gained currency in regard to the Whitestone Forge & Construction Company of Whitestone, L. I., to the effect that the plant had been closed down for lack of work. The fact is that the inquiries and orders were more than the works could possibly undertake without very extensive and absolutely necessary additions and alterations.

Enz & Orr, Denver, Col., iron founders, are adding a \$2500 foundry to their plant. The new building will be completed about January 1, and will be equipped with the most modern appliances for making both light and heavy gray iron castings.

The William Bayley & Sons Company, Milwaukee, Wis., founders and machinists and manufacturers of the Bayley hot blast system for heating large buildings, are rapidly recovering from their recent fire. They are building a new brick machine shop and blower department of heavy mill construction, to be three stories high. One building will have dimensions of 70 x 150 feet and one 50 x 200 feet. A blacksmith shop is also being added, 60 x 80 feet. These buildings are to be equipped with new machinery throughout and will cost about \$35,000.

Articles of association of the Hodge Iron Company, Houghton, Mich., who were organized in July under the laws of Illinois, were filed in that city November 22. The articles show that the capital stock of the company is \$100,000. The duration of the corporation is 50 years, and the stockholders and shares held by each are as follows: Charles J. Hodge, 998 shares; L. A. Hagle, 1 share; M. Wolfe, 1 share. Charles J. Hodge is president and manager.

We have already quoted the fact that the Carroll-Porter Boiler & Tank Company of Pittsburgh, whose plant in that city was destroyed by fire some time since, have decided to erect new shops at Wellsville, Ohio. The main building will be 400 feet in length and 80 feet wide, and will have a wing 45 x 90 feet. The company get a free site of 6 acres and \$15,000 bonus in consideration of their building the new works at Wellsville.

The American Engineering Company of Springfield, Ohio, have been organized, with the following officers: President and general manager, J. F. Winchell; secretary and treasurer, E. L. Dodson. They are equipping a plant and will manufacture gas and gasoline engines and attrition mills and pulverizers.

The fact was noted in these columns last week that the Republic Iron & Steel Company had given a contract to the Lloyd Booth Company, at Youngstown, Ohio, for an 18-inch billet mill for their Bessemer plant at the Brown-Bonnell Works in Youngstown. We may state that a contract has also been given to the Filer-Stowell Company, Milwaukee, Wis., for the engine to drive this mill. It will be a 44 and 82 x 60 inch stroke, cross-compound direct connected engine.

The Pittsburgh Engineering Company of Pittsburgh recently installed two 100 horse-power gas engines, direct connected by clutch coupling, in the Arrott Power Building, Barker place, Pittsburgh, to drive one 100-k.w. generator. The advantage secured by this peculiar type of installation is that of economy, in that the power required during a large part of the day can be delivered by one engine. At other times, when the power required is beyond the capacity of one engine, the second engine is thrown into connection on the generator shaft the same as the first one, and the combined power of the two engines will deliver the full rated capacity of the generator. This peculiar type of gas engine—the two cycle (which delivers a power impulse every revolution)—gives the closest regulation possible to secure in gas engine practice. The variation of the voltmeter is within one volt.

R. A. Wilson & Co., Shousetown, Pa., will operate a brass foundry in the vacant plant of the Sharon Boiler Company at Sharon, Pa.

The Pittsburgh Casting & Machine Company of Allegheny, Pa., are building an addition to their works 60 x 150 feet. Some new machinery is to be installed and the force of employees increased.

The Bessemer Gas Engine Company, at Grove City, Pa., have completed foundations for another building, 60 x 110 feet, and will also erect a small addition 60 x 32 feet.

The Interstate Foundry Company of Cleveland, who were organized a few weeks ago with Martin Mullen president and B. H. Laven secretary and treasurer, have laid the foundations for their new foundry and are making every effort to have the buildings ready for occupancy shortly after the first of the year. They will have in the neighborhood of 100,000 square feet of floor space and will produce all kinds of light castings. Knox & Elliott of Cleveland are erecting the buildings. Contracts for the equipment are now being closed.

The Broomell, Schmidt & Stacey Company, York, Pa., were incorporated recently with a capital of \$150,000. The above company absorbed Broomell, Schmidt & Co., Limited, and continue the manufacture of the American fuel economizer, steam heating apparatus, induced draft systems, &c., at the plant of the latter company. Business conditions with them have been good, inquiries are of good volume and orders are on their books sufficient to keep the shops going for some time. Among recent



orders completed was one of two American fuel economizers which was shipped to Guadalajara, Mexico, and a complete water softening plant was shipped to Knepper, Franklin County, Pa.

The Akron Engineering Company of Akron, Ohio, have been incorporated under the laws of West Virginia; capital stock, \$100,000. Incorporators are C. A. Stowers, H. C. Spicer, R. E. Nevin, G. E. Kohler and Harvey Musser. Plans have been completed for two brick buildings, one 50 x 75 feet and the other 75 x 90 feet; the former will be used as a machine shop and the latter as a foundry. There will also be a separate office building.

The Bethlehem Foundry & Machine Company, Bethlehem, Pa., report a heavy trade in their pneumatic and steam single stroke riveters, also on their Universal bending machines. These are being shipped abroad, largely to Sweden and Norway, and also to the western portions of the United States. Foreign inquiry and trade has been very good. Domestic trade is now quite active, although there was some falling off noted during the latter part of October. The November and December business thus far, however, has been exceptionally good, and orders have been taken that will keep them busy well over into next year.

Robt. Poole & Sons Company, Baltimore, Md., are busy in all departments of their works. They have had a satisfactory year and a number of good orders are on the books which will be sufficient to keep them going well over into next year. They have recently completed and shipped to Australia a specially designed system of gearing, having direct electrical connection. This gearing is to be used for driving a large Cornish pump. Other large orders are in course of construction; one of heavy pumping machinery for the Calumet & Hecla Company is well under way. Foreign inquiry has been good and orders have been satisfactory.

J. B. Smalley has purchased the interest of W. T. Smalley in Smalley Bros. & Co., Bay City, Mich., manufacturers of steam engines and saw mill machinery. The firm now consist of Wm. Smalley, the estate of D. C. Smalley and J. B. Smalley.

John Brennan & Co., Detroit, Mich., manufacturers of steam boilers, tanks, &c., are building an addition, 225 x 100 feet, to their works. The construction of the new building is a steel frame inclosed in brick and glass.

The Mahony Mfg. Company, at the corner of Fifth avenue and Liberty street, Troy, N. Y., have been recently equipped with additional boilers, a new engine and an electric lighting plant. The placing of the electric plant involved extensive changes in the arrangement of machinery at the foundry. It is now one of the most modern and best equipped foundries in the State.

#### Hardware.

The Thomas Laughlin Company, Portland, Maine, manufacturers of ship chandlery hardware, have added to their plant a one-story brick warehouse containing about 12,000 square feet. They have also recently purchased adjoining real estate containing about 30,000 square feet.

The Stewart Architectural Iron Works, Cincinnati, Ohio, have just been awarded the contract for supplying the 590 steel cells and other architectural iron work for the new Government prison to be built at Atlanta, Ga., to cost \$2,000,000.

Lee, Cowan & Bowen, Syracuse, N. Y., manufacturers of carriage, wagon and truck springs, are increasing the capacity of their plant by the addition of new machinery. The working force will also be increased.

The Jackson Cushion Spring Company, Jackson, Mich., have been organized, with the following officers: E. C. Greene, president; W. W. Hewitt, vice-president; H. E. Edwards, treasurer, and F. B. Grego, secretary.

The Humason & Beckley Mfg. Company, New Britain, Conn., are installing an electric lighting system in their plant.

The Law Mfg. Company, successors to John Law, Mankato, Minn., have incorporated and will manufacture Law's haying tools and other farming implements at St. Anthony Park, Minn.

George Johnson, Catasaugua, Pa., manufacturer of unfinished steel gongs, sizes 1½ to 4 inches diameter and of bright cold rolled steel strips, whose plant has been idle the past week undergoing repairs, &c., will start on full time next week.

#### Miscellaneous.

The large structural iron works of Geo. L. Mesker & Co., at Evansville, Ind., were destroyed by fire on the 5th inst. The fire is supposed to have originated in the foundry. The loss is estimated at \$105,000, with insurance for \$25,000. The buildings of several adjoining factories were also damaged to some extent, but not seriously.

The Fairbury Wind Mill Company and the Fairbury Iron Works Company, Fairbury, Neb., have consolidated, and in addition to the large building now being used by the former a brick addition, 52 x 40 feet and two stories high, will be erected at once. The new company will manufacture on a considerably larger scale the Fairburn wind mill, on which a good trade has been built up, also pumps and all kinds of iron work.

The North Pittsburgh Foundry & Steel Company of Pittsburgh, with works in Allegheny, Pa., are large makers of cast iron soil pipe and fire hydrants. The concern also make cast-

ings of all kinds for water works and house and street drainage. The concern advise us that owing to the fact that they are located in the center of the Pittsburgh district they are able to supply that market at a small profit, while outside concerns, with prevailing close margins, can only do so at a loss after deducting freight and other charges.

The Cheshire Brass Company, West Cheshire, Conn., whose brass casting shop, used in connection with their brass rolling mill, was entirely destroyed by fire last August, have replaced the same by a new building 40 x 90 feet, completely equipped and thoroughly up to date.

The Christopher & Simpson Architectural Iron & Foundry Company, St. Louis, Mo., have incorporated with a capital stock of \$200,000; capital in Illinois, \$10,000.

F. M. Hartman, W. H. Heuschen and J. Hartman, Jr., St. Louis, Mo., have incorporated the Perfection Tufting Machine & Mfg. Company with a capital stock of \$5000. About January 1 they expect to be ready for business.

The Joseph Dick Agricultural Works, Canton, Ohio, manufacturers of feed and ensilage cutting machinery, are largely increasing the capacity of their plant. A new wing, 40 x 60 feet, is being added to the main building, and a blacksmith shop and oil room, 40 x 25 feet, will shortly be erected. They expect to have both buildings completed by January 1. The demand for their new Blizzard cutter has necessitated the additions.

W. H. Colean, J. W. McDowell and C. S. Burdich, Peoria, Ill., have organized the Colean Implement Company, with a capital stock of \$25,000. They intend to handle heavy agricultural machinery exclusively until next fall, when they will put in a full line of light farm machinery.

The Beaver Falls Car Window Screen Company, composed of Pittsburgh parties, have leased a factory at Beaver Falls, Pa., and will manufacture screens for railroad car windows. The screen has been tested on a fast train on the Pittsburgh & Lake Erie Railroad and is said to be a success. The factory is expected to be in operation by the first of the year.

Among the orders recently received by the Buffalo Forge Company through their Chicago branch, 22-24 West Randolph street, Chicago, Ill., is a contract with the Quay-Daykin Company of Chicago for heating and ventilating the Sloan Building, the plant to consist of a 120-inch fan, driven by a direct connected vertical engine, together with six sections of Buffalo fan system heater and other accessories, as cleaning screens, piping dampers and the like. Another contract from the same source with the Goodman Mfg. Company of Chicago for heating and ventilating their machine shop calls for a 120-inch fan, direct connected to a Buffalo single vertical engine, together with heater, &c. The Buffalo Forge Company have likewise received through their Chicago office a contract with the Centerville Iron Works of Centerville, Iowa, for placing a heating and ventilating plant in the Centerville High School.

The molding and blacksmith departments of the J. I. Case Threshing Machine Company, Racine, Wis., commenced work on Monday, December 3, after being closed three months. As soon as possible the machine and wood departments will resume and when in full operation from 1200 to 1500 men will be employed. The factory will operate ten hours per day, wages will remain the same, and as many orders have been received a busy year is expected.

The large addition to the Chattanooga Steel Roofing Company's plant, Chattanooga, Tenn., has been completed, and the work of installing the new electrical machinery will be commenced at once.

The Economy Implement Company, manufacturers of farm implements, now located at Monmouth, Ill., have perfected arrangements for moving to Des Moines, Iowa, within the next week or two. Some of the company's goods are now en route, and by January 1 the enterprise will be turning out products in Des Moines. It is the intention of the company to add to their line of manufactured articles, and the name will be changed to the Economy Mfg. & Supply Company.

S. V. Huber & Co., Ferguson Building, Pittsburgh, Pa., have been appointed consulting engineers for the recently organized Youngstown Iron, Sheet & Tube Company, at Youngstown, Ohio. The same concern are also consulting engineers for the Republic Iron & Steel Company.

The Pittsburgh Construction Company, Second National Bank Building, Pittsburgh, builders of iron and steel structures, have received an order from the Reminton-Martin Company, for the erection of a steel frame building at Norwood, N. Y.

Bids are being asked by the municipality of Cienfuegos, Cuba, for the construction of a sewerage system and a system of water works for that city. The water is to be obtained from the River Hanabanilla, which runs a short distance from the town.

## The Iron and Metal Trades.

Our monthly blast furnace statistics show that for the first time since June 1 there has been an increase in the production of Pig Iron, the capacity of the Coke furnaces at work on December 1 being 222,067 tons weekly, as compared with 207,381 tons on November 1 and 288,771 tons on June 1. Coke Iron stocks have declined 80,250 tons during November, so that the statistical position has grown much sounder during November.

Some contracts for next year's supply of Coke have already been closed, but since they are at delivered prices, it is impossible to judge closely what the figure at oven was. It is understood that the producers of the Connellsville region are holding for \$1.80, while in the Pocahontas district \$1.65 was done some time since. The price is now \$1.75. The demand for Coal is now so heavy in this district that the collieries are indifferent as to the Coke business. In the New River district the asking price is \$2.50.

It is understood that the Ore interests of Lake Superior are to meet toward the end of January, so that probably nothing will be done until then.

Good news to makers of Pig Iron comes from one branch, whose requirements have been very light this year, and that is the Cast Iron Pipe industry. Authorities in the trade report that not for many years has the demand for large Pipe, 24-inch to 60-inch, been so large so early in the season as now. New York and Brooklyn led off with 30,000 tons some time since. This week the Boston Water Board received bids for about 5250 tons, and the Sewerage Board of the same city is in the market for 7500 tons. While the prospects for tonnage are good, there is, however, a very sharp struggle for supremacy going on between the consolidation and the outside interests, and very low prices are being made.

The Billet trade is very quiet, and while the export shipments on old orders continue very large, very little new business is being taken. As a matter of fact, that is true of the whole line of Iron and Steel products, with the possible exception of Rails and of Structural Material. The European makers are thoroughly aroused, while the buyers show great timidity, in view of the sharp decline which has taken place. In some few cases exporters did, when placing orders, secure the option to sell in this country, and some tonnage is thus being resold here, but it is not important in any branch.

The general outlook does not encourage the belief that the export movement will be as heavy as it is now, unless very considerable sacrifices are made. The large interests avow that what is absolutely necessary in this direction will be done to keep a footing.

In the Rail trade further large sales have been made, the most notable, of 80,000 tons for the Vanderbilt lines, being distributed among four mills. The report that the Norwegian railroads had given an order for about 12,000 tons to Eastern manufacturers is confirmed.

No specially noteworthy transactions have taken place in Structural Material, but good inquiries continue to come forward and the outlook is excellent.

The Plate makers have made a further advance of \$1 per ton, while the leading Sheet interest have established the price of 2.80c., Pittsburgh, for No. 27 Black Sheets and 75 per cent. discount for Galvanized Sheets.

The makers of Bars report continued activity from all sources, the requirements for car building being still heavy. The report of a larger cotton crop than expected is favorable to the Cotton Tie branch, which has been rather languishing.

## A Comparison of Prices.

At date, one week, one month and one year previous.

### Advances Over the Previous Month in Heavy Type. Declines in Italics.

	Dec. 12, 1900.	Dec. 5, 1900.	Nov. 14, 1900.	Dec. 13 1899.
<b>PIG IRON:</b>				
Foundry Pig, No. 2, Standard, Philadelphia.....	\$15.75	\$15.50	\$15.50	\$23.25
Foundry Pig, No. 2, Southern, Cincinnati.....	13.75	13.75	13.25	20.50
Foundry Pig, No. 2, Local, Chicago.....	14.50	14.50	14.50	23.50
Bessemer Pig, Pittsburgh.....	13.50	13.50	13.50	24.00
Gray Forge, Pittsburgh.....	13.25	13.25	13.00	21.00
Lake Superior Charcoal, Chicago....	19.50	19.50	17.00	25.00
<b>BILLETS, RAILS, ETC.:</b>				
Steel Billets, Pittsburgh.....	19.75	19.75	19.75	34.00
Steel Billets, Philadelphia.....	21.00	21.00	21.00	23.00
Steel Billets, Chicago.....	20.75	20.75	20.75	37.00
Wire Rods, Pittsburgh.....	33.00	33.00	33.00	...
Steel Rails, Heavy, Eastern Mill....	36.00	36.00	36.00	35.00
Spikes, Tidewater.....	1.50	1.50	1.45	2.65
Splice Bars, Tidewater.....	1.35	1.35	1.30	2.35
<b>OLD MATERIAL:</b>				
O. Steel Rails, Chicago.....	11.00	11.00	11.00	30.00
O. Steel Rails, Philadelphia.....	16.00	16.00	14.50	23.00
O. Iron Rails, Chicago.....	17.50	17.50	17.50	26.00
O. Iron Rails, Philadelphia.....	17.50	17.50	17.00	27.00
O. Car Wheels, Chicago.....	15.50	16.00	15.00	21.00
O. Car Wheels, Philadelphia.....	17.00	17.00	16.50	21.00
Heavy Steel Scrap, Chicago.....	11.00	11.00	10.00	18.00
<b>FINISHED IRON AND STEEL:</b>				
Refined Iron Bars, Philadelphia....	1.45	1.45	1.40	2.20
Common Iron Bars, Youngstown....	1.30	1.30	1.25	2.10
Steel Bars, Tidewater.....	1.40	1.40	1.35	2.40
Steel Bars, Pittsburgh.....	1.25	1.25	1.20	2.30
Tank Plates, Tidewater.....	1.58	1.48	1.50	2.50
Tank Plates, Pittsburgh.....	1.40	1.35	1.35	2.35
Beams, Tidewater.....	1.65	1.65	1.65	2.40
Beams, Pittsburgh.....	1.50	1.50	1.50	2.25
Angles, Tidewater.....	1.55	1.55	1.55	2.40
Angles, Pittsburgh.....	1.40	1.40	1.40	2.25
Skelp, Grooved Iron, Pittsburgh....	1.45	1.45	1.57½	1.95
Skelp, Sheared Iron, Pittsburgh....	1.50	1.55	1.55	2.35
Sheets, No. 27, Chicago.....	3.20	3.20	3.05	3.00
Sheets, No. 27, Pittsburgh.....	2.90	2.90	2.80	2.85
Barb Wire, f.o.b. Pittsburgh.....	2.50	2.80	2.80	3.55
Wire Nails, f.o.b. Pittsburgh.....	2.30	2.30	2.30	2.95
Cut Nails, Mill.....	1.95	1.95	1.95	2.45
<b>METALS:</b>				
Copper, New York.....	16.75	16.75	16.75	16.75
Spelter, St. Louis.....	4.05	4.12½	4.05	4.60
Lead, New York, Desilverized.....	4.37½	4.37½	4.37½	4.65
Lead, St. Louis, Common.....	4.40	4.30	4.29½	4.60
Tin, New York.....	26.25	27.62½	27.90	25.00
Antimony, Hallett, New York.....	9.25	9.50	9.50	9.75
Nickel, New York.....	55.00	55.00	55.00	38.00
Tin Plate, Domestic Bessemer, 100 lbs., New York.....	4.19	4.19	4.19	4.84

### Chicago. (By Telegraph.)

Office of The Iron Age, 1205 Fisher Building, CHICAGO, December 12, 1900.

Instead of relapsing into the dullness which was expected as a natural result of the exceedingly active condition of trade in November, the market has recently improved and quite a good volume of business is in progress. The demand in some branches is, in fact, much more active than is usually the case in December. Quite a number of buyers have been in the habit of deferring their purchases until about January 1, because they expect that December trade will be dull and manufacturers are inclined to make concessions. This year the situation is so strong that such buyers are now coming into the market and are paying full prices, realizing that it is fruitless for them to wait longer.

**Pig Iron.**—The tonnage placed during the past week has been fully as large as during the previous week, and possibly somewhat larger. Numerous trades have been made of 500 to 1000 ton lots and several have gone to considerably higher figures. It is reported that an implement company placed contracts for 4000 tons equally divided between Northern and Southern Iron. The Northern furnace companies continue to take the greater part of the business now coming up, as their prices are still under those of the Southern manufacturers. The local producers, however, are becoming so well sold up for the next five or six months that it is found increasingly difficult to arrange for deliveries on new business which will satisfy their customers. Some large tonnage has on this account been passed during the week. The pressure for more rapid delivery is very strong. Consumers who a few weeks since were quite indifferent about making arrangements for their Iron supply are now urgent for deliveries of larger quantities than the furnace companies can make. Any Iron on track unsold is quickly taken. Numbers of consumers are daily inquir-



ing for anything available in this way. Quotations are as follows:

Lake Superior Charcoal.....	\$19.50 to \$20.00
Local Coke Foundry, No. 1.....	15.00 to 15.75
Local Coke Foundry, No. 2.....	14.50 to 15.25
Local Coke Foundry, No. 3.....	14.00 to 14.75
Local Scotch, No. 1.....	15.00 to 16.25
Ohio Strong Softeners, No. 1.....	16.25 to 16.50
Southern Silvery, according to Silicon..	16.10 to 16.60
Southern Coke, No. 1.....	15.35 to 15.85
Southern Coke, No. 2.....	14.60 to 15.10
Southern Coke, No. 3.....	14.10 to 14.60
Southern Coke, No. 1 Soft.....	15.35 to 15.85
Southern Coke, No. 2 Soft.....	14.60 to 15.10
Foundry Forge.....	13.60 to 14.10
Gray Forge and Mottled.....	13.60 to 14.10
Southern Charcoal Softeners, according to Silicon.....	15.00 to 17.00
Tennessee Silicon Pig.....	17.00 to 18.50
Alabama and Georgia Car Wheel.....	20.00 to 20.35
Malleable Bessemer.....	15.00 to 15.50
Standard Bessemer.....	15.00 to 15.50
Jackson County and Kentucky Silvery, 8 per cent. Silicon.....	17.50 to 18.50

**Bars.**—Trade is moderately active, conditions showing some improvement over the previous week. The quietness following the November spurt of buying has given way to a renewed demand. The transactions of the past week are understood to have covered no very large sales, but the buying is well distributed, coming from all classes of consumers and all localities. A typographical error last week made the quotation of mill shipments of Common Iron 1.35c., Chicago. This should have been 1.45c. Mill shipments of Common Iron are firm at 1.45c. to 1.50c.; Soft Steel Bars, 1.40c. to 1.45c., and Hoops, 1.95c., base. The demand for early shipment is so strong that 1.50c., Chicago, was secured on an order for 1000 tons of Common Iron. The movement from jobbers' stocks continues fully as heavy as it has been. Jobbers report that they would be able to handle considerably more business if they could get better shipments from the mills. Prices on small lots from stock are continued at 1.75c. to 1.80c. for Common Iron, 1.60c. to 1.70c. for Steel Bars, and 2c. to 2.20c. for Hoops.

**Car Material.**—The car builders continue to purchase good quantities of materials of all kinds entering into car construction. The demand for car material exceeds all expectations and continues much longer than anticipated. Railroad companies are steadily ordering additional rolling stock or arranging to manufacture cars for themselves. The scarcity of cars continues a source of annoyance to shippers.

**Structural Materials.**—Quite a number of projects covering a heavy tonnage which have been heretofore mentioned in this report are still held up. Some of them are depending on the labor situation in this city, while others are deferred for special reasons. It is expected, however, that they will all develop into contracts at an early day. Good orders for Structural Materials for stock are steadily being received. The consumption of Shapes in small buildings is increasing, bringing a constant trade to those who carry such material in stock. An advance of \$1 per ton has been made in the price of Universal Plates. Mill shipments are quoted as follows: Beams, Channels and Zees, 15 inches and under, 1.65c.; 18 inches and over, 1.75c.; Angles, 3 inches and over, 1.55c.; Angles, under 3 inches, 1.45c. rates; Tees, 1.60c.; Universal Plates, 1.55c. Small lots of Beams and Channels from local yards are quoted at 2.10c. to 2.25c.; Angles, 1.60c. to 1.70c. rates, and Tees, 1.75c. to 1.85c.

**Plates.**—Another advance of \$1 per ton has been made in Plates since last report, and a discrimination has also been made between carloads and less than carloads, the smaller quantity taking a price of \$1 per ton above the carload price. Manufacturers report another good week in contracts. The business from the local warehouses has been fair for December. The boiler works and tank shops are not driving with business at present, but a good demand is coming from manufacturers of specialties. Mill shipments of Tank Plate, ¼-inch and heavier, in less than carload lots, are quoted at 1.55c. to 1.60c., Chicago; Flange, 1.65c.; Marine, 1.75c. Jobbers quote small lots from store at 1.75c. to 1.85c. for Tank and 2c. for Flange.

**Sheets.**—Manufacturers continue to enjoy a large business. The demand for more rapid shipments is becoming stronger, and notwithstanding the starting of additional idle mills the leading Sheet company are getting

further in arrears. The starting of the mill at Hammond, Ind., is one of the possibilities of the near future if business continues to increase. The statement made last week that an advance had been made was based on what appeared to be authentic information, but has since proved to be an error. Mill shipments of No. 27 Black Sheets are quoted at 3.10c., Chicago, and Galvanized Sheets at 75 per cent. off. Jobbers are having a good demand from manufacturers of specialties, but the consumption in the building trade has further diminished, owing to the lateness of the season. Small lots from stock are quoted at 3.25c. to 3.30c. for No. 27 Black, 2.30c. for No. 16, 2.20c. for No. 14, 2c. for No. 12, 1.90c. for Blue Annealed No. 10, and 70 and 5 off for Galvanized.

**Merchant Steel.**—Business is running a little above the average for the time of the year; no large lots are now being sold, but quite a steady demand for small quantities is coming from all classes of consumers. An advance is noted in Cold Rolled Shafting, carload lots being now held at 57 off and less than carloads at 52 off. Manufacturers of specialties are also putting up their prices, an advance being noted this week on Vehicle Seat Springs. Mill shipments, Chicago delivery, are quoted as follows: Smooth Finished Machinery Steel, 1.75c. to 1.90c.; Smooth Finished Tire, 1.75c. to 1.95c.; Open Hearth Spring Steel, 2.15c. to 2.40c.; Toe Calk, 2.40c. to 2.60c.; Sleigh Shoe, 1.70c. to 1.90c.; Cutter Shoe, 2.40c. to 2.60c.; Cold Rolled Shafting, 57 off. Ordinary grades of Crucible Tool Steel are quoted at 6c. to 7c.; Specials, 13c. upward.

**Merchant Pipe.**—The good trade noted for several weeks continues in full force. Manufacturers' prices, random lengths, are as follows:

	In carloads.	Less than carloads.
	Blk. Galvd.	Blk. Galvd.
½ to ¾ inch and 11 to 12 inches.....	59.2	46.2
¾ to 10 inches.....	66.7	53.3
	61.9	49.9

Boiler Tubes are in steady request. Quotations are continued as follows:

	Steel.	Iron.
1 to 2¼ inches, exclusive.....	50	40
2½ inches.....	50	42½
2¾ to 5 inches.....	60	50

**Coke.**—Contracts are now being made for next year's supplies by both large and small consumers. Large consumers are securing special prices, but on Standard 72-hour Coke to the foundry trade prices are maintained at \$4.50 to \$5, Chicago.

**Rails and Track Supplies.**—Railroad companies are steadily placing contracts for Steel Rails for next year's delivery, the business thus entered during the past week aggregating about 40,000 tons. Inquiries are coming forward from not only established roads, but projected steam and electric enterprises. Light Rails are also in good demand. Heavy Sections are still quoted at \$26 and Light Sections at \$25.50 to \$28, according to weight. Track Supplies are also in very good demand, with Splice Bars quoted at 1.35c.; Spikes, 1.65c. to 1.75c.; Track Bolts, with Hexagon Nuts, 2.55c., and Square Nuts, 2.40c.

**Old Material.**—The market is quiet. The approaching end of the year causes consumers to be careful about adding to their stocks prior to the inventory season. Some weakness is reported in certain classes of Old Material, but dealers are quite confident that the turn of the year will see a better demand and consequently are not endeavoring to force sales. The following are approximate quotations per gross ton:

Old Iron Rails.....	\$17.50 to \$18.50
Old Steel Rails, mixed lengths.....	11.00 to 11.50
Old Steel Rails, long lengths.....	14.00 to 15.00
Relaying Rails.....	20.00 to 22.00
Old Car Wheels.....	15.50 to 16.00
Heavy Melting Steel Scrap.....	11.00 to 11.50
Mixed Steel.....	9.00 to 9.50
Iron Fish Plates.....	17.50 to 18.00
Steel or mixed do.....	10.00 to 10.50
Iron Car Axles.....	19.50 to 20.00
Steel Car Axles.....	16.00 to 16.50
No. 1 Railroad Wrought.....	16.00 to 17.00
No. 2 Railroad Wrought.....	13.50 to 14.00
Shafting, Iron and Soft Steel.....	17.00 to 17.50
No. 1 Dealers' Wrought.....	11.00 to 11.50
No. 1 Mill.....	7.50 to 8.00
No. 2 Mill.....	6.00 to 6.50
No. 1 Busheling.....	8.50 to 9.00
No. 2 Busheling.....	7.50 to 8.00

Iron Car Axle Turnings.....	10.00 to	10.50
Soft Steel Axle Turnings.....	8.50 to	9.00
Machine Shop Turnings.....	7.50 to	8.00
Wrought Drillings.....	6.00 to	6.50
Cast Borings.....	4.00 to	4.50
Mixed Borings and Turnings.....	5.00 to	5.50
No. 1 Boilers, cut.....	9.50 to	10.00
Boiler and Ship Scrap.....	8.00 to	8.50
No. 1 Cast.....	13.50 to	14.00
No. 2 Cast.....	9.50 to	10.00
Railroad Malleable Cast.....	13.00 to	13.50
Agricultural Malleable Cast.....	10.50 to	11.00

**Metals.**—The close of navigation on the lakes has advanced the price of Copper. Carload lots of Lake are now quoted at 17½¢. and Casting brands at 17¼¢. Pig Lead is quiet but unchanged, Desilverized being held at 4.32½¢. and Corroding at 4.42½¢. in 50-ton lots.

## Pittsburgh.

Office of *The Iron Age*, Hamilton Building, 1  
Pittsburgh, December 12, 1900. (By Telegraph.)

**Pig Iron.**—We continue to note a quiet Pig Iron market, and there will probably not be much buying until after the first of the year. It is reported that a leading consumer may come into the market early next year for a round lot of Bessemer Pig. Two or three more furnaces in the Valley will start up about the first. Prices on Bessemer Iron are weak and it is probable that \$13.50, Pittsburgh, could be shaded. There has been a considerable movement in Forge Iron and sales of Standard grades have been made up to \$13.50, Pittsburgh. There is not a great deal doing in Foundry Iron, consumers apparently being covered for some little time ahead. No. 2 is selling at prices ranging all the way from \$14 up to \$14.50. We quote Bessemer Iron at \$13.50, Pittsburgh, but note that several small sales of 100 to 200 tons are reported at slightly higher prices. Gray Forge Iron is \$13.25 to \$13.50 and No. 2 Foundry is \$14 to \$14.50.

**Billets.**—There is nothing special to note. The Billet pool is reported to be in good shape, and sales of small lots are being made right along at pool prices. We quote Bessemer Billets, Pittsburgh, Wheeling and the Valleys, at \$19.75, delivered. Billets, smaller than 3½ inches, are \$1 extra. Carbons higher than 0.21 and up to 0.60 are \$1 extra; 0.61 up to 1 are \$2 extra. Basic Open Hearth Steel, \$1 a ton extra over the price of Bessemer. For cutting small Billets, 50c. per ton extra.

**Sheet and Tin Bars.**—We quote Sheet and Tin Bars for Pittsburgh, Wheeling and the Valleys at \$20.75. For cutting Sheet and Tin Bars, 50c. per ton extra.

**Muck Bar.**—We quote Standard grade Muck Bars at \$25.50, Pittsburgh.

(By Mail.)

The outcome of the meeting of railroad presidents being held in New York to-day (Tuesday) to consider the rate situation is being awaited with a good deal of interest. It seems certain that Pittsburgh will get lower rates on Iron and Steel products of all kinds for Eastern shipment. The scheme is to put Pittsburgh and Buffalo on the same basis as regards freights to New York. A reduction of 40c. a ton on Billet and Pig Iron rate is talked of, but not confirmed. An effort is also being made by shippers to get Iron and Steel products reduced from fourth and fifth classes to fifth and sixth classes, but it is not known whether this will be done. Probably the biggest order of the week was that of the Lake Shore road for 80,000 tons of Rails, equally divided between four mills. We also note a very heavy tonnage in Plates, one leading interest having enough tonnage on their books to carry them through three or four months, and are buying from smaller mills. Prices have been advanced \$1 a ton. The general demand for Finished Material, outside of Plates and Shapes, is not as heavy as it has been, and will probably fall off more between now and the first of the year. Pig Iron and Billets continue quiet.

**Plates.**—As stated in this report last week, the Plate Association have advanced prices of Sheared Plates \$1 a ton. A meeting of the Plate mills was held in New York City, and after a careful review of the situation, and in view of the fact that the demand for Plates at the present time is beyond the capacity of the mills to

furnish, it was decided to make the advance. As noted last week, a very heavy tonnage in Plates is being placed with the mills, and prompt deliveries are almost impossible to get. The Carnegie Steel Company, notwithstanding their tremendous capacity for turning out Plates, have for some time been having Plates rolled at other mills in order to help them out on contracts for early delivery. A new list of delivered prices has also been adopted by the mills equal to about the price f.o.b. Pittsburgh, plus the tariff rate. In some cases, however, part of the freight rate has been absorbed by the mill. We have advanced prices on all grades of Plates \$1 a ton, and now quote: Tank quality, ¼-inch and heavier, 1.40c.; 3-16-inch, 1.45c.; under 3-16-inch and above No. 10, 1.50c.; Flange or Boiler Steel, 0.1c. advance over base of Tank; Marine and Fire Box, American Boiler Manufacturers' Association specifications, 0.2c. advance over Tank; Still Bottom Steel, 0.3c. advance over Tank; Locomotive Fire Box Steel and equivalent specifications, 0.5c. advance over Tank, all f.o.b. Pittsburgh.

**Structural Material.**—Demand for Structural Shapes is almost as heavy as for Plates, and the Structural mills are pushed to their utmost to get out material as fast as needed. A very large amount of work has recently been placed, and a good many contracts are in sight that are likely to be given out within a very short time. The American Bridge Company have recently taken a large amount of work, and their various shops are congested with business. A good deal of local work is coming up, and the contemplated Frick office building, it is stated, will take close to 5000 tons. The Oliver Building has already been placed, calling for about 1200 tons. A good many contracts for railroad bridges in the West and South have recently been given out, calling for a heavy tonnage. The prospects are that the Structural mills will have all the work they can take care of in the next three or four months, or longer. Prices are unchanged, with the exception of Plates, which we have advanced \$1 a ton. We quote: Beams and Channels, up to 15-inch, 1.50c.; over 15-inch, 1.60c.; Angles, 3 to 6 inches, inclusive, 1.40c.; over 6 inches, 1.50c.; under 3 inches, 1.25c.; Tees, 1.50c.; Tees, 1.55c.; Bars, 1.10c. to 1.15c.; Universal and Sheared Plates, 1.40c., all f.o.b. Pittsburgh.

**Ferromanganese.**—We quote 80 per cent. Ferro at \$62.50 in carload lots, delivered at buyer's mill.

**Steel Bars.**—The principal difficulty that consumers of Bars have at this time is to get deliveries. Buyers who were fortunate enough to place orders some time since, when prices were much lower than they are now, find it almost impossible to get deliveries. The leading Bar mills are filled up, and some of them are turning away business, unable to make required deliveries. The absolute minimum price of Steel Bars is 1.25c., and a buyer who wants early delivery would probably have to give 1.30c. In fact, we are advised that several leading mills are holding firm at that price. We quote Steel Bars at 1.25c. to 1.30c., in carload lots at mill, half extras, and for small lots 1.35c. is charged. The demand for Iron Bars is almost as heavy as for Steel, and the various mills in the West belonging to Republic and American Steel Hoop are all in operation to utmost capacity, with orders ahead for several months. We quote Common Iron Bars at 1.30c., Valley mill, half extras, equal to 1.35c., Pittsburgh. Three or four local concerns who roll high grade Iron Bars from special stock get from 1.60c. up to 1.75c. for this class of material.

**Rails.**—The Vanderbilt interest, controlling the Lake Shore & Michigan Southern and other roads, have placed an order for 80,000 tons of Steel Rails, not 100,000, as reported. The order has been equally divided between Carnegie, Lackawanna, Illinois and National Steel Company. The local mill has also taken an order for 6000 tons of Steel Rails for the Great Eastern Railway Company, at London, England, shipments to commence at once. A good deal of foreign business in Rails is being placed, a large order having just been taken by Pennsylvania and Maryland Steel companies. The Edgar Thomson Works are now in full operation and rolling Rails by the Kennedy-Morrison process, which has proven very successful. It is claimed that Rails rolled



by this process will last very much longer than Rails rolled in the ordinary manner. It is estimated that between 1,000,000 and 1,200,000 tons of Rails have been booked by the Rail mills for next year. We quote \$26 at mill.

**Sheets.**—The condition of the Sheet trade is about the same as noted in this report last week. Practically all the Sheet mills are in full operation, with enough orders on their books to take care of their output for several months. In fact, we may note that some makers of Sheets advise us that they are out of the market for first quarter. We quote No. 27 Black Sheets, box annealed, one pass through cold rolls, at 2.90c. to 2.95c. and No. 28, 2.95c. to 3c. We are advised that the leading interest are quoting considerably higher prices. Galvanized Sheets are higher, and we quote at 70, 10 and 5 per cent., 15c. freight.

**Skelp.**—We note an active demand for Iron Skelp, but there is little doing in Steel. We quote Grooved Iron Skelp at 1.45c. to 1.50c. and Sheared at 1.50c. to 1.55c. For very wide sizes higher prices are asked. We quote Steel Skelp at 1.32½c. to 1.35c., delivered in Pittsburgh district, terms four months. A sale of 500 tons of Grooved Iron Skelp is reported at a price equal to about 1.45c., Pittsburgh.

**Merchant Steel.**—A fair amount of tonnage is being placed, and prices are firm. Cold Rolled Shafting has again been advanced. We quote Plow Slabs, ¼-inch and heavier, at 1.60c., base; Tire Steel, 1.35c. to 1.40c.; Toe Calk, 1.70c. to 1.75c.; Open Hearth Machinery, 2c., base; Open Hearth Spring, 2c., base; Hammered Lay Steel, 3c. to 3.25c.; Rolled Lay Steel, 2.75c. to 3c.; Cold Rolled Shafting, 57 per cent. off in carload lots; 52 per cent. in less than carload lots, delivered in base territory. Tool Steel, 7c. and upward, according to quality. On Tool Steel freight is allowed east of the Mississippi River. Terms are 30 days net, except Tool Steel, on which 60 days are allowed, less 2 per cent. off for cash in 10 days.

**Tubular Goods.**—There is still a scarcity of Pipe of certain sizes, but mills are making better deliveries than for some time. A fair amount of tonnage is being placed, but not so heavy as some time since. Prices are firm and to consumers are as follows:

Merchant Pipe.		
	Black. Per cent.	Galvd. Per cent.
¾ to 1½ inch and 11 to 12 inch.....	61	48
¾ to 10 inch.....	68½	56
Casing, Random Lengths.		
	S. & S.	I. J.
2 to 3 inch.....	58	53½
3¼ to 4 inch.....	63	59
4¼ to 12½ inch.....	65	61½
Casing, Cut Lengths.		
	S. & S.	I. J.
2 to 3 inch.....	53½	49
3¼ to 4 inch.....	59	55
4¼ to 12½ inch.....	61½	57½
Boiler Tubes.		
	Up to 22 feet. Per cent.	
Steel.		
1 inch to 1½ inch and 2½ inch.....	55	
1½ inch to 2¼ inch.....	51	
2½ inch to 13 inch.....	62	
Iron.		
1 inch to 1½ inch and 2½ inch.....	49½	
1½ inch to 2¼ inch.....	45	
2½ inch to 13 inch.....	57	

Prices to jobbers are 5 per cent. or more less than the above.

**Connellsville Coke.**—We can note a much better demand for both Furnace and Foundry Coke. It is estimated that at the present time 70 per cent. of the total capacity in the Connellsville region is active, and it is expected that within a week or two fully 75 per cent. will be employed. A good many furnaces are getting ready to blow in, which will mean an increased demand for Furnace Coke. Among these are Colebrook, Lebanon, Cornwall, and several stacks of Lackawanna Iron & Steel Company. Two or three more stacks in the Valleys will also blow in about the first of the year. Last week out of 20,960 ovens in the Connellsville region, 14,859 were active and 6101 idle, the output having been 155,050 tons. A good many consumers of Blast Furnace Coke are covered for first half by contracts. We quote strictly Connellsville Furnace Coke at \$2 and Foundry at \$2.25 to \$2.50 a ton. In exceptional cases our price on Blast Furnace Coke has been shaded. For Coke made outside

the Connellsville region much lower prices are being quoted.

**Iron and Steel Scrap.**—There is nothing of special interest to note. A fair amount of business is being placed, but most buyers are holding off until after the first of the year. We quote: No. 1 Railroad Wrought Scrap at \$14 to \$14.50 net ton; Old Iron Rails, \$19.50 to \$20 gross ton; Old Steel Rails, \$15 to \$15.50; No. 1 Tank and Pipe Scrap, cut, \$10.50 to \$11 net ton; Turnings, \$6.50 to \$7; Cast Iron Borings, \$5 to \$5.50; Low Phosphorus Melting Stock, \$14.50 to \$15; Soft Busheling Scrap, \$10.50 to \$11; Old Horseshoes, \$12 net ton. We note a sale of 100 tons of Borings at \$5.50, delivered. Also a sale of 250 tons of Low Phosphorus Melting Stock, under 0.03 phosphorus, at \$15. Also a sale of 150 tons of Horseshoes at \$12 net ton, delivered.

The Kane-Maloney Iron & Steel Company of Pittsburgh have applied for a charter, with a capital of \$25,000. The offices of the new company are at 817 Park Building, Pittsburgh. The new company will buy and sell Old Material, and have purchased a site of land on Fifty-seventh street and Allegheny Valley Railroad, where the Scrap yard will be located. Contracts for building of equipment for the yard have been placed. Thomas Carlin's Sons Company of Allegheny will furnish two large shears, one of which will weigh 25,000 pounds, will have a 32-inch blade and will cut 6 inches of Cold Steel. It will be one of the largest shears ever built. The other will weigh 24,000 pounds and will have a 20-inch blade. The equipment will also consist of a 20-ton crane and a 75 horse-power gas engine.

## Philadelphia.

Office of The Iron Age, Forrest Building, {  
PHILADELPHIA, PA., December 11, 1900. }

The market is beginning to go into winter quarters. Buying is comparatively light, but deliveries are being hurried forward in a way that indicates a very large consumption of Iron in all departments. Prospects appear to be brighter than ever, with the single exception of the export trade, which is affected by the higher prices here, coincident with lower prices abroad. How long this disparity will continue, and to what extent it will reach, cannot be foreseen, but in the meanwhile it is not felt much, as large shipments are being made on old sales, and until these are completed it will not have any great influence. There is a very general impression that prices of Iron and Steel are not likely to show any material change in the near future, and that is probably one reason why buyers are less anxious than usual to make long contracts, a feeling which is about equally shared by sellers. After the holidays there may be a change of sentiment, but in the meanwhile prices are considered safe and fairly satisfactory. Business in all departments is exceedingly active, and it is many years since the general situation was as encouraging as it is to-day. There does not appear to be much danger of unwarrantedly high prices, or of unduly low prices, while the demand promises to be good and the capacity for meeting it very nicely proportioned.

**Pig Iron.**—There is but little change from last week. The demand is less active, and the market will probably continue dull until after the holidays. Requirements for the near future are pretty well covered, and as shipments are called for with considerable urgency, makers of Iron are in the meanwhile under no necessity for seeking new business. It appears to be a foregone conclusion that prices are not likely to show much change, so that so far as regards an advance or a decline, there is nothing to influence people to change their position either from bull to bear, or from bear to bull. As a rule current quotations are satisfactory, and if business during the late winter and early spring months can be maintained on the basis of the past two months, there is little more to be desired. Sales during the week have been mostly on a basis of \$15.75 to \$16, delivered, for No. 2 X Foundry, Philadelphia or nearby points. Sometimes a little more is paid for a favorite brand, sometimes a little less for new brands or for such as are less popular, but, on the whole, it is a steady, quiet, firm

market, with the range of prices about as follows for Philadelphia and nearby points: No. 1 X Foundry, \$16.50 to \$17; No. 2 X Foundry, \$15.75 to \$16.25; No. 2 Plain, \$15 to \$15.50; Standard Gray Forge, \$14.50 to \$15; Ordinary Gray Forge, \$14 to \$14.25; Basic, \$14.75 to \$15.

**Billets.**—There is very little business being done, but prices are steady at \$21 for Bessemer, and \$22 for Open Hearth Steel.

**Plates.**—The feeling in this department is very strong, and a slight advance in prices, besides other changes, has been made during the past week. The mills are working in close harmony with each other, and as there is an abundance of work, both present and prospective, there is every reason to believe that prices will be maintained. Among the new rules of the trade the following will be in force: Widths over 100 up to 100 inches, extra will be 0.5c. per lb.; 110 to 115 inches, extra will be 0.10c. per lb.; 115 to 120 inches, extra will be 0.15c. per lb.; 120 to 125 inches, extra will be 0.25c. per lb.; 125 inches, by special agreement. All Circles and Sketches will be 1-10c. per lb. extra. This includes all Plates not strictly rectangular, except Taper Plates not under 30 inches wide at the small end, and where difference in width is not over 4 inches. For these there will be no extra charge. Plates thinner than  $\frac{1}{4}$  inch on edges, but not under 3-16 inch, will be 0.05c. per lb. extra. Plates thinner than 3-16 inch but under No. 8, B. W. G., will be 0.10c. per lb. extra. Shell grade is henceforth abandoned. Prices for deliveries at nearby points are now as follows: Plates,  $\frac{1}{4}$ -inch and thicker, 1.55c. to 1.60c.; Universals, 1.55c. to 1.60c.; Flange, 1.65c. to 1.75c.; Charcoal Iron Plates, C. H. No. 1, 2.25c.; Best Flange, 2.75c.; Fire Box, 3.25c.

**Structural Material.**—There is no particular change to notice in this department, business being of much the same character as for several weeks past. There is plenty of work on hand; in some cases deliveries are weeks behind, and in no case is there any shortage of orders. Prices are firm but unchanged, as follows: Angles, 3 inches and upward, 1.65c. to 1.75c.; less than 3 inches, 1.35c. to 1.40c.; Beams and Channels, 15-inch and upward, 1.65c. to 1.75c.

**Bars.**—There is no let up in the demand and from the number of inquiries that are coming in it looks as though business would be good all through the winter months. There is a large output, but pretty much everything is in operation, and as regards eastern Pennsylvania it will not be easy to make much increase, although it is understood that the West has still a moderate amount of unemployed capacity. Prices are very firm, 1.40c. at mill being a minimum, with 1.45c. to 1.50c. quoted in cases in which the mills are exceptionally full of work. Steel Bars are quoted at 1.40c. to 1.50c., delivered.

**Sheets.**—Business continues to be very active, all descriptions of Sheets being in demand at full prices. The mills are on full time in all departments, but find it difficult to meet calls that are made for early deliveries. Prices firm, quotations for best Sheets being as follows (common Sheets two-tenths less): No. 10, 2.20c.; No. 14, 2.40c.; No. 16, 2.60c.; Nos. 18-20, 3.10c.; Nos. 21-24, 3.20c.; Nos. 26, 27, 3.30c.; No. 28, 3.40c.

**Old Material.**—The demand has fallen off somewhat and prices are not as stiff as they were a week ago. Holders appear to be very confident of their position, however, and are not disposed to make much concession, unless in cases where it is necessary to save expenses of removal. Bids and offers for deliveries in buyers' yards are about as follows: Choice Railroad Scrap, \$17.50 to \$18.50; No. 1 Yard Scrap, \$13 to \$14; No. 2 Light Scrap, \$11.50 to \$12.50; Machinery Cast, \$14 to \$14.50; Heavy Steel Scrap, \$16 to \$17; Old Iron Rails, \$17.50 to \$18; Old Steel Rails, \$16 to \$17; Wrought Turnings, \$9.75 to \$10.25; Cast Borings, \$7.75 to \$8.25; Old Car Wheels, \$17 to \$18; Iron Axles, \$20 to \$22; Steel Axles, \$17 to \$18.

The Carnegie Steel Company of Pittsburgh now maintain four foreign branch offices as follows: 71 and 72 King William street, London, England; Bell Telephone Building, Montreal, Canada; Apartado, 924, City of Mexico, Mexico; 3 Kazan Plain, St. Petersburg, Russia.

## Cincinnati. (By Telegraph.)

Office of The Iron Age, Fifth and Main streets, {  
CINCINNATI, December 12, 1900. }

There is but little can be said in regard to the Pig Iron market of the past seven days. A quiet, steady feeling has prevailed and it should not be lost sight of that the tone is also quite strong and with no indications for a different condition in the near future. There has been a good steady trade in small and medium sized orders for all grades of Foundry Iron. Mill Irons continue very dull and are the only grades in the list in regard to which there is a question. The feature of the business is the demand for immediate delivery, and in a number of instances buyers have asked for advancements on next year's contracts. In regard to prices the market is practically unchanged, both in regard to Northern and Southern products. The price on Basic Iron is unchanged. Freight rate from Birmingham is \$2.75 to this point; from the Hanging Rock district, \$1. We quote, f.o.b. Cincinnati:

Southern Coke, No. 1.....	\$14.25 to \$14.50
Southern Coke, No. 2.....	13.75 to 14.00
Southern Coke, No. 3.....	12.75 to 13.00
Southern Coke, No. 4.....	12.50 to 12.75
Southern Coke, No. 1 Soft.....	14.25 to 14.50
Southern Coke, No. 2 Soft.....	13.75 to 14.00
Southern Coke, Gray Forge.....	12.50 to 12.75
Southern Coke, Mottled.....	12.50 to 12.75
Ohio Silvery, No. 1.....	17.00 to 17.50
Ohio Silvery, No. 2.....	16.00 to 16.50
Lake Superior Coke, No. 1.....	15.50 to 16.00
Lake Superior Coke, No. 2.....	14.50 to 15.00
Lake Superior Coke, No. 3.....	13.50 to 14.00
Southern Basic.....	to 14.25

### Car Wheel and Malleable Irons.

Standard Southern Car Wheel, chilling grades.....	\$18.75 to \$19.75
Standard Southern Car Wheel, No. 2.....	17.75 to 18.75
Lake Superior Car Wheel and Malleable.....	19.00 to 20.00

**Plates and Bars.**—There has been a good steady market, with an increase in the volume of business and a stiffer feeling in regard to prices. Quotations are unchanged. We quote, f.o.b. Cincinnati: Iron Bars, in carload lots, 1.45c., with half extras; in small lots, 1.75c., with full extras; Steel Bars, in carload lots, 1.40c., with half Steel card extras; Base Angles, in carload lots, 1.50c. to 1.55c.; Plates, 1.55c. for  $\frac{1}{4}$ -inch and heavier; Sheets, No. 10, 1.95c.

**Old Material.**—Upon an unchanged basis, the market is very steady and has been fairly active throughout the week. Dealers' buying prices per gross ton are, f.o.b. Cincinnati: No. 1 Wrought Railroad Scrap, \$15.25; Cast Railroad and Machinery Scrap, \$11; Old Iron Axles, \$17; Iron Rails, \$18; Steel Rails, rolling mill lengths, \$13; short lengths, \$12; Car Wheels, \$15.

## Cleveland.

CLEVELAND, OHIO, December 11, 1900.

**Iron Ore.**—A meeting of the Ore Association has been appointed for Cleveland for January 25, and until that time no effort will be made to establish carrying freights. When this meeting is over and the price of next year's Ores has been fixed, negotiations between the Ore shippers and the vesselmen will be opened, looking to the establishment of the contract rate. The crowded condition of the stock piles along the south shore of the lakes and the immense demand for Ore at the furnaces has led the Ore handlers to expect better wages for loading the Ores into the cars. At a meeting of the officers of the 'Longshoremen's Union with the dock managers this week the rates were fixed at 7 $\frac{1}{2}$ c. a ton for shoveling in by machinery and 9c. by hand. Engineers and hoisters get \$2.15 per day.

**Pig Iron.**—A large business has been done the past week in Pig Iron. The sales cover deliveries for the first quarter of next year, with a good many of them extending over into the second quarter. After that time the buyers are cautious, as the price then will depend upon the price of Ore, to be fixed the latter part of January. Foundry Irons have been selling in 500 and 1000 ton lots this week and the sales have been numerous. The prices obtained have been \$14 and \$13.50 on Nos. 1 and 2 Foundry, respectively, Valley furnace. Basic has been sold in good sized quantities at \$13.50, and off Basic has sold at \$12.50, the transactions at this figure, how-



ever, having been light. The melters of Bessemer are drawing heavily from their stock piles, which prove to be dwindling rapidly. This condition has occasioned a lively inquiry for material, and one inquiry alone covered 20,000 tons. This caused almost a sensation on the market, leading to a great deal of talk of opening up the idle Bessemer furnaces. So far no orders of resumption have been issued. The whole tone of the iron market is stronger.

**Rails.**—The Lake Shore came into the market this week and closed for its order for 25,000 tons of Steel Rails, this having been pending for several weeks. At the same time the Nickel Plate Railroad placed an order for 5000 tons. The market has also heard of other large sales having been made to the Vanderbilt lines, aggregating upward of 75,000 tons. The pool price of the mills, \$26, was paid. The biggest business in sight is for the electric lines. A number of inter-urban electric railroads are now being built or projected through Northern Ohio, which are demanding large quantities of Rails. This week has seen inquiries for 15,000 tons, with other large orders in prospect for the near future.

**Billets.**—The Billet market is picking up some. This week has brought out one sale of 500 tons, with other orders in waiting. The mills are still using their product in the manufacture of other articles, so that the supply from which to draw is not large by any means. The association price of \$19.75 for Billets was obtained on the recent sale.

**Shapes.**—The business in Structural Steel has been good this week, the same activity reported a week ago continuing, with a large tonnage placed. The prices have not changed from 1.50c. and 1.40c.

**Old Iron.**—The increased interest in Old Irons reported a week ago has continued through this last week, with the result that the dealers were successful in advancing prices slightly, at which some good sized sales were made. The prices quoted are generally higher than they have been for months and the market all the way through is lively. The market might be quoted this week as follows: No. 1 Wrought Scrap, \$16 net; No. 1 Busheling, \$13 net; Heavy Steel, \$14 gross; Turnings, \$9; Borings, \$6.50; Machinery Cast, \$13.

### St. Louis. (By Telegraph.)

Office of The Iron Age, 1205 Chemical Building, {  
St. Louis, December 12, 1900. }

**Pig Iron.**—There is very little to say concerning the market this week. Prices are unchanged and steady. The turn of the year is so close at hand that but little interest is aroused either on the part of buyer or seller. Carload business for regular Irons and fill in orders for specials are being received right along. Heavy tonnage is not coming to the front, but from the present steady melting rate it is judged that the purchasers of November must come again into the market within the next 60 days. Some of the railroads are now preparing to place contracts for Castings covering wants for the ensuing year. The interested foundries have inquiries out and expect to protect themselves is successful in securing the business. Those furnaces which have been lately reported as sold up on Foundry grades are said to be in the same good condition and have practically no free Iron to market. Some other producers have no No. 1 to sell under \$12, Birmingham. We quote, f.o.b. St. Louis:

Southern, No. 1 Foundry.....	\$15.00 to \$15.25
Southern, No. 2 Foundry.....	14.50 to 14.75
Southern, No. 3 Foundry.....	14.00 to 14.25
No. 1 Soft.....	15.00 to 15.25
No. 2 Soft.....	14.50 to 14.75
Gray Forge.....	13.50 to 13.75

**Bars.**—The week develops a quieter movement. No quantity of moment is being negotiated for and no change as to that nature of transactions is expected until the new year has set in. Meanwhile consumers' ordinary wants do not show signs of much curtailment. Plates have had an advance of \$1, and are quoted at 1.60c., base, East St. Louis. Mill prices for both Iron and Steel in heavy tonnage only still remain 1.45c. to 1.50c., half extras, East St. Louis. Jobbers have advanced prices on less than carloads and quote 1.75c. to 2c., full extras.

**Rails and Track Supplies.**—There continues to be a very good call for Track Supplies at firm prices. Nothing new has come to light concerning Rails, the orders being on the pick up order. We quote: Splice Bars, 1.50c. to 2c.; Bolts, with Square Nuts, 2.20c. to 2.30c.; with Hexagon Nuts, 2.30c. to 2.40c.; Spikes, 1.70c. to 1.80c.

**Pig Lead.**—Comparative dullness still prevails. Somewhat better inquiry was noted the past week, but no sales of consequence took place. Common Lead reported at 4.20c.; better brands at 4.22½c.; Chemical at 4.25c., and Desilverized still held at 4.32½c. Lead Ore also unchanged at \$46.

**Spelter.**—Price shows a decline. Producers have answered inquiries on a basis of 4.05c., St. Louis, for substantial tonnage, but did not succeed in making the trade at that figure. Zinc Ore showed a little betterment at \$29 per ton.

### New York.

Office of The Iron Age, 282-288 William street, {  
New York, December 12, 1900. }

**Pig Iron.**—Only a moderate amount of business is being done locally. The majority of the founders in the district are covered for the immediate future. The export trade is very quiet and little movement expected, in spite of the fact that freights have receded materially. Quotations are as follows at tidewater: Lehigh, Schuylkill and Virginia Irons, No. 1, \$17 to \$18; No. 2 X, \$15.75 to \$16; No. 2 Plain, \$14.75 to \$15; Gray Forge, \$14.50 to \$15. Tennessee and Alabama brands, No. 1 Foundry, \$15.50 to \$16; No. 2 Foundry, \$14.50 to \$14.75; No. 1 Soft, \$15.50 to \$15.75; No. 2 Soft, \$14.50 to \$14.75; No. 3 Foundry, \$14 to \$14.25; No. 4 Foundry, \$13.50 to \$13.75; Gray Forge, \$13.50 to \$13.75.

**Cast Iron Pipe.**—There are signs of increasing activity, the demand for large Pipe, above 24-inch in particular, developing in a very satisfactory manner. Among the sales during the past week was a lot of 2000 tons for a local gas company. The Metropolitan Water Board of Boston opened bids on Monday for 2250 gross tons of 48-inch Pipe and about 3000 tons of 60-inch Pipe, the results of which are not yet known. During recent lettings of small lots in New England lately there has been a wide disparity of prices and some very low figures have been quoted. Among the larger contracts coming up is a lot of 6000 tons of 60-inch Pipe and 1500 tons of smaller Pipe for the Metropolitan Sewerage Board of Boston. Providence will open bids to-morrow for 550 tons of smaller Pipe. There is some inquiry for export. Among others there is one for nearly 10,000 tons for South America.

**Steel Rails.**—An Eastern mill will secure its share of the Vanderbilt order, while another Eastern works took 12,000 tons for Norwegian roads. We quote \$26 for Standard Sections, \$25 and \$26 for Light Sections, and \$38 to \$38.50 for Girder Rails. We quote Spikes, 1.50c. to 1.60c.; Splice Bars, 1.35c. to 1.40c.; Square Track Bolts, 2.10c. to 2.15c., and Hexagon Bolts, 2.25c. to 2.30c.

**Finished Iron and Steel.**—No very large contracts were placed in this district for Structural Material during the week. We quote as follows at tidewater: Beams, Channels and Zees, 1.65s. to 1.70c.; Angles, 1.30c. to 1.40c.; Tees, 1.65c. to 1.75c.; Bulb Angles and Deck Beams, 1.90c. to 2c.; Universal Mill Plates, 1.58c. to 1.60c.; Sheared Steel Plates are 1.58c. to 1.60c. for Tank, 1.68c. to 1.70c. for Flange, 1.78c. to 1.90c. for Fire Box. Charcoal Iron Plates are held at 2.25c. for C. H. No. 1, 2.75c. for Flange and 3.25c. for Fire Box. Refined Bars are 1.40c. to 1.45c.; Common Bars, 1.30c. to 1.35c.; Soft Steel Bars, 1.35c. to 1.40c., and Hoops, 1.90c. to 2c., base, on dock.

The International Acheson Graphite Company of Niagara Falls have received an order for a carload of powdered graphite from the Sherwin-Williams Paint Company. Another interesting order received by the International Acheson Graphite Company is for five carloads of graphitized electrodes from Italy, where they are to be used in electro-chemical work.

## Metal Market.

Office of *The Iron Age*, 232-238 William street, }  
New York, December 12, 1900. }

**Pig Tin.**—A further sharp decline has characterized the market during the week under review, prices breaking  $1\frac{1}{4}$ c. per pound. The market closed weak to-day, at  $26\frac{1}{4}$ c. to  $26\frac{1}{2}$ c. for spot, and 26c. sellers, for December and January. The London market broke even to a greater extent. The decline for the week under review is £7, the market closing weak to-day at £116 for spot and futures. The weakness which this article is now showing originally came from the heavy shipments from the Straits during October and November. The present quotation is back to the level of values which existed about the beginning of this year, and offers a contrast with the prices reached during the month of July, when as high as £152 was quoted. Looking over the statistics for this year, we find that the total visible supply during the 11 months just past decreased at the rate of only 100 tons per month. It will thus be seen that the statistical situation was not sufficiently strong to uphold the extremely high prices which have been quoted, and that the prices could only have been held by wild speculation. While the decline has been very sharp, it is stated in certain quarters that the price is still high, and it is also suggested that if the shipments during the next few months continue as heavily as during October and November, prices may reach a considerably lower point.

**Copper.**—This market is very quiet, only very small and scattered transactions being reported. While there is no quotable change in price, it is nevertheless a fact that the market is showing signs of weakness. The tone of the market is considerably easier. Both buyers and sellers are holding off, and among the transactions reported some have been made at figures below the ruling quotation. One special lot of Lake is reported to have been made at  $16\frac{1}{4}$ c. The quantity is said to have been 60,000 lbs. It is also said that there have been sales of Electrolytic in certain instances at  $16\frac{1}{2}$ c. The prices generally quoted and adhered to by the large producers and merchants are: 17c. for Lake and  $16\frac{1}{2}$ c. for Electrolytic and Casting. The London market has been lower during the week and closed easy to-day at the lowest point, with £71 5s. for spot and £71 17s. 6d. for three months' futures. Best Selected has declined 5 shillings and is quoted to-day £78 10s.

**Pig Lead.**—There is no change in the condition of this market. There is a steady demand for small quantities. No large business is reported. Prices are unchanged, the American Smelting & Refining Company still quoting  $4.37\frac{1}{2}$ c., New York, and  $4.32\frac{1}{2}$ c., St. Louis, for desilverized in lots of 50 tons and more. London has scored a further decline of 5 shillings during the week, the price to-day being £16 7s. 6d.

**Spelter.**—The market is very weak and considerably lower. The price has declined to 4.20c., New York, for spot and December. The St. Louis market is also considerably lower, sales being reported at 4c. The reason given for the present decline is speculation in the St. Louis market by large Eastern parties. The London market has also declined and the quotation to-day comes £18 15s. Reports from all quarters indicate that buyers are very scarce.

**Antimony.**—Is unchanged, Hallett's being quoted  $9\frac{1}{4}$ c. and Cookson's  $10\frac{1}{4}$ c.

**Nickel.**—No change in the market is reported. Prices are still nominally 55c. to 60c. for small lots. Large lots are unobtainable.

**Quicksilver.**—Is unchanged. Prices quoted here are \$51 per flask of  $76\frac{1}{2}$  lbs. in lots of 50 flasks and more. The London market is unchanged at £9 2s. 6d.

**Tin Plate.**—An exceptionally good business is reported, at unchanged prices. The demand comes from all branches of the trade, jobbers' wants being especially heavy. The prices quoted by the American Tin Plate Company for the balance of this year and the first quarter of 1901 are on a basis of \$4.19 per box of 100-lb. Cokes, New York delivery, or \$4, f.o.b. mill.

The Reading Foundry Company of Reading, Pa., have assigned.

## Lake Iron Ore Matters.

DULUTH, MINN., December 9, 1900.—Reports of ore shipments of a number of leading mines of all ranges have been received from the managers of the companies by *The Iron Age*. The list cannot be made complete for some time, as many mines are not through and every one of the mines of the Minnesota Iron Company, with the exception of Auburn, are still shipping, and will do so for some days yet. Indeed, it is probable that this company will not close their mines for the winter for a week or so from this date, there being several ships yet to come from the lower lakes that are loaded and must take out coal cargoes and reload with ore before the docks are closed, and handling freight now is slower business than when everything is smooth. There is no increase in the volume of ore the company are taking down, but severe storms delayed their ships so that the docks were full of ore when the cold snap came, and a further delay was occasioned by frozen ore, all of which has served to keep the company operating till very late. When the year closes the shipments from the docks of this company will be somewhere between 4,000,000 and 4,100,000 tons, or about 500,000 tons above a year ago.

In my last correspondence I referred to the move of the Minnesota Railway Commissioners for the reduction of the iron ore freights as a political matter, and doubted what the effect might be. The animus of the commission has come out very plainly this week. It happened that the leading attorney for the Duluth & Iron Range Road, Mr. Kellogg, broke his arm while returning from the funeral of his late law partner, Senator C. K. Davis. Mr. Kellogg was quite seriously injured and is now confined to his bed. His associate counsel for the road, J. H. Chandler, is so deaf that he can hear none of the testimony. The Duluth & Iron Range Road is, of course, as much interested in the question of rates as any other road, and when an application was made for a continuance till Mr. Kellogg could be present no one supposed it would be denied. But it was, the commission taking up the Duluth, Missabe & Northern Road and the Great Northern, though the ore traffic of the latter is interstate business and not subject in any way to the commission. The Missabe Road is now introducing testimony, and has sufficient to keep the committee busy for a month or more. It is expected that the commission, when it finds the case may be prolonged into the term of its successor, will order a cessation of the hearing of testimony on the part of the road and proceed to a decision on the incomplete hearing. Under these circumstances a decision will have little weight and may quite possibly be disregarded by the roads. It is not improbable that reductions in the rates on ore to Minnesota lake ports will be made in a short time, but it is very doubtful if they are made on the strength of any such hearing as is now in progress. As a matter of fact, so large a proportion of the ore carried in the State is carried for the owners of the roads—or for the Oliver Iron Mining Company—that a reduction of rates would be a far less important matter for the roads than appears on the surface.

### A New Lake Ore Harbor.

Plans have been prepared for the improvement of Burlington Bay, a part of the Lake Superior frontage owned by the Duluth & Iron Range Road for its ore port, but heretofore unavailable on account of its situation. There is a sharp point extending between Agate Bay, in which are the road's five ore and two other docks, and Burlington Bay. Agate Bay has been improved by breakwaters, but the area is limited and any further dock improvements must be carried on elsewhere. Burlington Bay lies exposed to the most severe storms that sweep that portion of Lake Superior, the northeastern gales, and in order to improve it a breakwater of about 2200 feet in length must be built. This the Government will be asked to authorize, and the president of the road is now in Washington to place the matter before the proper committee. The commerce handled by the road is immense, 4,000,000 tons of ore alone this year, and is constantly growing, and there can



seem scarcely any reasonable doubt that the work will be undertaken and rapidly pushed through. The break-water will extend from the shore line to the 60-foot contour line, and will cost several hundred thousand dollars. It will give room for the expenditure of as many millions by the road. Burlington Bay is an ideal site for docks, with deep water close to shore, no shallows and a clay bottom, and plans for the utilization of the entire area have been made. There will be five ore docks, to cost some \$650,000 each, two large lumber docks and ample room for coal and merchandise docks. There is a large plateau about 70 feet above water on which yards will be put in, and a convenient town site. The completion of this improvement, which is of course years in the future, will give the road facilities for shipping more than twice the ore it now handles, and that it is demanded shows the vast plans for the future that are being laid in this part of the country.

#### The Atikokan Range.

An option on the Atikokan range has been given a large steel producer of the United States, the deal reported in daily newspapers as having been made by Corrigan, McKinney & Co. for this range having never reached an advanced stage. The range will be thoroughly explored this winter. I am authorized by Ferdinand Schlesinger of the Newport Iron Company to deny the statement that he has sold, or is selling, the Newport mine to the Oliver Company. This was mentioned by me two weeks ago as common newspaper rumor. The report that the Oliver Company have bought the Corrigan mines at Crystal Falls falls under the same category, in all probability.

The Cleveland Cliffs Iron Company will be given a deed to 120 acres of land at Marquette for a furnace site whenever they proceed to the erection of a charcoal blast furnace there. This will be undertaken shortly, bearing out what I have said as to intended extensions of the company in the line of manufacture. Most of the charcoal furnaces of the Michigan belt are running heavily and doing excellent work. The Cleveland Cliffs acreage of ore and timber lands now exceeds 225,000 acres, a vast extent, and well covered with hard woods.

#### The Mesaba Range.

On the Mesaba range the White mine is being opened at Mesaba Station, ready to mine a considerable amount of ore next year. It will haul to market over the Duluth & Iron Range Road. There will be three shafts, and possibly an open pit proposition also, if the mine shows up big enough. At the Stevens mine the Duluth, Missabe & Northern Road is completing surveys for trackage and will build soon. The Chisholm Mining Company will install machinery and proceed to open a mine at their property adjoining the Clark, where a nice body of high grade ore has been found. At the Sharon Steel Company's property there is now a stripped area 350 feet square and about 20 feet deep, that has been made since about midsummer. The ore is some 50 feet below ground, and stripping will be continued all winter with a large force, in order to make the mine a shipper next spring. A shaft is being sunk, as the mine will be operated by the milling process. Two steam shovels are at work in the stripping at the Stevenson mine, which is almost an ideal proposition for an open pit mine. The surface is about 25 feet and the mine is situated on a high side hill so as to be most easily drained. The ore has been reached at several points by the stripping and next year's output will probably be very large. D. B. Oliver of Pittsburgh has bought the Sheridan property in 3, 57-21, 3 miles west of Hibbing, paying therefor \$225,000. The property has been under Oliver lease for six or seven years, they paying royalty thereon, though the mine has never been opened. Several transactions have recently taken place in lands along the ore belt in the east end township 59-14, where the White is located. The last of these was this week, under which certain lumbermen lease 160 acres in section 21 on a 25-cent lease and a 50,000-ton minimum. Ore is said to have been found there. Ore has been found on lands belonging to the Mesaba Central Land & Exploration Company in section 14, 58-19.

#### Menominee Range.

The first train over the Chicago, Milwaukee and St. Paul line to the Crystal Falls district has been run. The road's ore dock at Escanaba has been completed and is ready for next year. It is several months behind time. It is 720 feet long, has 120 pockets of 250 tons capacity, is 66 feet high and has a total capacity of 30,000 tons. The Mansfield is advertising for bids for sinking a new shaft. The Lamont is closed down. Its shaft settled last summer and a new one would be necessary if the mine should continue work. The ore body is good and a shaft will be sunk in time. A shaft will be sunk to test an ore body found on Will Seldon's homestead at Iron River. Among shipments off this range for the season are the following of the larger mines that have given their figures to *The Iron Age*:

	Tons.	Tons.
Aragon .....	404,647	337,807
Bristol .....	51,635	80,915
Chapin .....	925,565	940,513
Clifford .....	119,940	93,025
Commonwealth .....	53,964	117,295
Penn Iron Company .....	196,548	229,651

#### Marquette Range.

A large amount of stock pile grading is going on along the Marquette range, especially by the Lake Superior and Regent companies, who evidently do not propose to have any difficulty in stocking all ore they may mine in the winter. The Beaufort has closed down tight and may be idle for a long time. The Barasa explorations are continuing since hoisting was discontinued, showing a large desposit of high grade Bessemer.

The No. 4 and No. 5 docks of the Duluth & Iron Range Road at Two Harbors are to be raised this winter to accommodate the newer and larger ships. One is now 52 and the other 54 feet high. Jackscrews are to be put under the docks and each structure raised as one piece. It will take 200 men and screws to do the work. One dock will go up 9 feet, the other about 6. Their capacity will not be changed. This is about the only piece of large constructive work planned around the lakes for ore shipping companies the coming winter.

The Duluth, South Shore & Atlantic Road has completed track laying on its new Mineral Range extension, which cuts off 50 miles for the run between Duluth and the copper country. The line runs through the range from Newton to the Mass mine, which has given the road a contract for handling its rock from mine to mill. The road was a very heavy job, there being in the 40 miles of line 1,000,000 yards of material to be moved and 4,000,000 feet of timber to be used in bridges, &c.

D. E. W.

## OBITUARY.

#### DAVID MILLS.

David Mills, senior member of the firm of Mills & Ferguson, iron founders, died on December 3 at his home in Hoboken, N. J., from Bright's disease, aged 66 years. He was born in Scotland and came to this country when a boy.

#### JOHN DREW.

John Drew, for many years superintendent of the Rogers Locomotive Works, at Paterson, N. J., died on December 5, at the Murray Hill Hotel, New York. Mr. Drew retired from business about ten years ago.

#### THOMAS F. COLFER.

Thomas F. Colfer, treasurer of the Laclede Car Company of St. Louis, Mo., died suddenly from heart disease on December 1, aged 53 years. Mr. Colfer was born in Ireland and came to the United States in 1864. Ten years ago he helped to organize the Laclede Car Company and became the treasurer of the concern.

#### HUGH M. BOLE.

Hugh M. Bole, a well-known resident of Bellevue, near Pittsburgh, died Saturday night, December 8, at the age of 74 years. He was a native of County Down, Ireland. He came to Pittsburgh in 1845 and served an apprenticeship in the machine business with Knapp, Totten & Co. In 1857 he entered a business partnership with Hugh M. Graham, under the firm name of Graham,

## QUOTATIONS OF IRON STOCKS DURING THE WEEK ENDING DECEMBER 12, 1900.

Cap'l Issued.		Thursday.	Friday.	Saturday.	Monday.	Tuesday.	Wednesday.	Sales.
\$29,000,000	Am. Car & Foundry, Common.....	20½-21¼	20 -20½	20 -20¼	20¼-21	20¼-22	21½-22	11,620
29,000,000	Am. Car & Foundry, Pref. (7 % Non-Cu.)	-67½	.....	66½-67½	68 -68¼	68 -68½	68½-68¾	3,214
19,000,000	Am. Steel Hoop, Common.....	27½-28¼	27½-27¾	27 -27¼	28 -30	29½-30	29½-31¼	14,825
14,000,000	Am. Steel Hoop, Pref. (7 % Cu.).....	-76¾	76 -76½	.....	76½-77	77 -77½	-79	1,970
50,000,000	Am. S. & W., Common.....	42½-43¾	41½-42¾	40½-42¾	41¼-43	41½-42¾	42½-45	85,510
40,000,000	Am. S. & W., Pref. (7 % Cu.).....	85½-86¼	85¼-86	84 -85	-85	85 -85½	86½-88¾	7,600
28,000,000	Am. Tin Plate, Common, N. Y.....	42½-43½	42¼-44	43¼-45	44½-46½	46 -47½	47½-50½	62,708
18,325,000	Am. Tin Plate, Pref., N. Y. (7 % Cu.)..	-87½	-88	.....	88 -88½	88½-89½	89¼-90	3,835
7,500,000	Bethlehem Iron.....	-59	-59	.....	-59	.....	.....	453
15,000,000	Bethlehem Steel, Par \$50, \$1 paid in..	.....	17½-18	.....	-17½	-17½	.....	599
7,974,550	Cambria Iron, Philadelphia*.....	-45¼	-45¼	.....	45 -45½	45 -45½	.....	357
16,000,000	Cambria Steel**.....	20¼-20¾	-20	19½-20	-20	-20	20½-20¾	4,191
11,000,000	Colorado Fuel & Iron.....	50½-51¾	49½-50½	49½-52	51½-52½	51½-52½	51½-52¾	27,900
46,484,300	Federal Steel, Common.....	49½-51¾	49½-50	49 -51½	51 -53	51½-52½	51½-53¾	198,730
53,253,500	Federal Steel, Pref. (6 % Non-Cu.)....	76 -76¼	75 -76¼	75¼-75½	76 -77	76½-77½	76¾-77¾	13,825
32,000,000	National Steel, Common, N. Y.....	34½-35¼	33½-34½	33 -34¼	34¼-38	36½-37¼	37 -39	19,665
27,000,000	Nat'l Steel, Pref., N. Y. (7 % Cu.).....	-93	-93	-93	.....	.....	-93¼	950
40,000,000	National Tube, Common, N. Y.....	60 -61	60 -60¾	60 -60¼	60 -61½	60½-61¼	61½-62	10,400
40,000,000	National Tube, Pref., N. Y. (7 % Cu.)..	103½-103¾	-103½	.....	-103½	103½-103¾	.....	1,650
5,000,000	Penna., Common, Philadelphia.....	.....	.....	.....	.....	-75	-73½	201
1,500,000	Penna., Pref., Philadelphia.....	.....	.....	.....	.....	.....	.....	.....
12,500,000	Pressed Steel, Common.....	-49½	49 -49½	48½-48¾	49 -49½	49 -49½	50 -50½	4,740
12,500,000	Pressed Steel, Pref. (7 % Non-Cu.)....	84 -85	83 -83¾	.....	-82¾	82¾-82¾	.....	1,550
27,191,000	Republic Iron & Steel, Common.....	15¼-16½	15½-15¾	15 -15½	15¼-15½	15¼-15½	15¼-16¼	9,436
20,306,900	Repub. Iron & Steel, Pref. (7 % Cu.)..	-65	-65	64½-64¾	64½-65	65 -65½	65½-65¾	3,470
7,500,000	Sloss-Sheffield S. & I., Common.....	.....	.....	.....	.....	.....	-23	300
6,700,000	Sloss-Sheffield S. & I., Pref. (7 % Non-Cu.)	-69½	-69	68 -68½	-69	.....	68 -68¾	1,035
20,000,000	Tennessee Coal & Iron.....	64 -69½	61½-63½	56½-60	58½-62½	62½-64	59½-64¼	141,680
1,500,000	Warwick Iron & Steel (par \$10).....	.....	.....	-8	-8¼	.....	-8¼	111

\* Par \$50. \*\* \$10.50 per share paid in. † 6% guaranteed by Beth. Steel Co. Late Philadelphia sales by telegraph. ‡ Ex-dividend.

**Bonded indebtedness:** Am. S. & W., \$130,656; Am. Tin Plate, none; Am. Steel Hoop, none; Cambria Iron Co., \$2,000,000 6% debenture 20-year bonds, 1917, payable option 5 years, assumed by Cambria Steel Co.; Federal Steel Co., \$9,822,000 Illinois 5%, \$7,417,000 E. J. E. R. R. 5%, \$1,600,000 Johnson 6%, \$6,732,000 D. & I. R. R. 5%, \$1,000,000 2d D. & I. R. R. 6%, \$10,000 land grant D. & I. R. R. 5%; National Steel, \$2,561,000 6%; National Tube, none; Tennessee C. I. & R. Co., \$8,367,000 6%, \$1,114,000 7%, \$1,000,000 7% cu. pref.; Pennsylvania Steel, \$1,000,000 5%, Steelton, 1st, 1917, \$2,000,000 5%; Sparrow's Point, 1st, 1922, \$4,000,000, consolidated, both plants; Bethlehem Iron, \$1,351,000 5% maturing 1907. Interest and principal guaranteed by Bethlehem Steel Co. Republic Iron & Steel, none; Warwick Iron & Steel, none; Colorado Fuel & Iron Co.; Col. Fuel Co. Gen. Mort. 6% \$880,000, Col. Coal & Iron Co. Mort. 6% \$2,810,000, Col. Fuel & Iron Gen. Mort. 5% \$2,303,000. Also outstanding \$2,000,000 preferred stock on which dividends have been paid to June 30, 1900. Sloss-Sheffield St. & I. Co., Sloss I. & S. first mortgage 6%, \$2,000,000, Sloss I. & S. general mortgage 4½% \$1,835,000.

Bole & Co. In 1860 he retired from the firm and engaged in the machine business for himself on Duquesne Way, Pittsburgh. He remained in active business until a few years ago. During the Civil War he ran his works night and day for several years in the manufacture of guns for the Federal Government. Four sons survive Mr. Bole—John, an oil well tool supply manufacturer of Pittsburgh; Frank H., engaged in the same business in Butler; William A. of the Westinghouse Machine Company, and George M. of the Pittsburgh Steel Construction Company.

## Iron and Industrial Stocks.

Nearly the whole list of iron and steel stocks showed some recovery during the week. Tin Plate had a sharp rise and was actively traded in on the strength of reports that a dividend will soon be paid on the common stock. Federal led in activity, a semiofficial report being to the effect that a lump dividend will be declared on the stock in January. Tennessee underwent some sharp fluctuations, with a break at the close. American Steel & Wire was influenced by conflicting rumors relative to dissensions in the board and the organizing of an opposition to the ruling element. National Steel has had a heavy advance. The business of all the Moore stocks, including also American Sheet Steel, is said to be very large and lucrative.

	Bid.	Asked.
American Bicycle Company, common.....	6½	7¼
American Bicycle Company, preferred.....	28½	29¼
American Bicycle Company, bonds.....	74	75¼
E. W. Bliss, common.....	125	137½
E. W. Bliss, preferred.....	125	137½
Cramp's Shipyard Stock.....	75	80
Diamond State Steel.....	4½	4¼
Empire I. & S., common.....	4	10
Empire I. & S., preferred.....	43	48
International Silver, common.....	4½	5
International Pump, common.....	29	29½
International Pump, preferred.....	76¼	77½
National Enam. & St., common.....	16	18
National Enam. & St., preferred.....	80	83
New Haven.....	5¼	5½
Otis Elevator, common.....	27½	28
Otis Elevator, preferred.....	88	89
Pratt & Whitney, common.....	3½	5
Pratt & Whitney, preferred.....	45	55
Tidewater Steel.....	8	8¼
U. S. Cast Iron Pipe Company, common.....	5	5¼
U. S. Cast Iron Pipe Company, preferred.....	31	33
U. S. Projectile.....	100	100
Val. C. I. & C., stock.....	5	6
Val. C. I. & C., bonds.....	37	37

H. R. Worthington, preferred.....	110	115
American Bridge Company, common.....	43	43½
American Bridge Company, preferred.....	92	92½
Crucible Steel, common.....	16	16½
Crucible Steel, preferred.....	77	78

The Colorado Fuel & Iron Company report for October net earnings of \$254,936, against \$182,848 in October, 1899, an increase of \$72,087. For the four months from July 1 to October 31 the net earnings were \$920,019, against \$534,121 in 1899, an increase of \$385,898.

**Dividends.**—The American Steel & Wire Company have ordered the payment of the fourth quarterly dividend of 1¼ per cent. on the common stock, which was declared at the beginning of the year, and have declared the regular quarterly dividend of 1¼ per cent. on the preferred stock, both payable January 2. Books close December 17 and reopen January 3.

The Niles-Bement-Pond Company will pay a dividend of 1½ per cent. on their common stock on December 20. Books close to-day and reopen December 21.

The Boston Belting Company have declared a quarterly dividend of 2 per cent., payable January 1. Books close December 15 and reopen January 1.

The Board of Directors of the Crucible Steel Company of America of Pittsburgh have declared the initial quarterly dividend of 1¼ per cent. on the preferred stock, payable December 29.

The directors of the Pittsburgh, Bessemer & Lake Erie Railroad Company held a meeting in the offices of the Carnegie Building, Pittsburgh, on Saturday, November 8, to discuss the proposed leasing of the road to another railroad corporation. It was decided to call a meeting of the stockholders of the road on January 16 next to vote on the proposition. The indications are that the plan to lease the road to a corporation to be formed soon and to be controlled by the Carnegie Company, who in turn will guarantee stockholders 3 per cent. dividends on the par value of their stock, will go through.

Parker C. Chandler, Otis Kimball and Edward C. Ellis, of Boston, Mass., have petitioned the general court for incorporation as the New York & Boston Canal & Transportation Company, with authority to build and operate a ship canal from Narragansett Bay to Taunton River and Massachusetts Bay.



## The New York Machinery Market.

Office of *The Iron Age*, 232-238 William street,  
NEW YORK, December 12, 1900. }

On all sides encouraging reports are to be heard regarding the condition of the machinery market at present, and the outlook for the future as well. During the week under review small transactions have been very numerous, and a number of large projects have been brought to the surface. The largest work now before machinery merchants is the list which the Westinghouse Electric & Mfg. Company intend purchasing for the equipment of the new British Westinghouse plant. The specifications are now in the hands of the large machinery builders and merchants. It is one of the largest lists ever presented to American machine tool builders, the aggregate value of the tools specified being estimated at \$500,000. A full machine shop equipment is included in the specifications, and a large number of the tools will be of the heavy types. It is said that the specifications are very lengthy and go into the minor details in the instance of each machine. A number of the items are so specified as to give the English machine tool builders a chance in the bidding. Although a representative of the British Westinghouse Company is now in this country, it is said that the machinery will be purchased by the Westinghouse Electric & Mfg. Company of Pittsburgh. The specifications have been sent out from Pittsburgh and the entire matter is being handled from that quarter.

The Delaval Steam Turbine Company of 74 Cortlandt street, New York, are about to erect a large factory at Trenton, N. J. Purchases are now being made of machine tools and power generating machinery for the equipment of the plant. Walter H. Foster of 126 Liberty street has been retained as consulting engineer, and he is supplying the company with the machinery. As their name indicates, the company will build steam turbines. The Delaval Separation Company, whose offices are also at 74 Cortlandt street, are said to be interested. An order for milling machines has been placed with the Brown & Sharpe Mfg. Company of Providence, R. I.

The W. J. Clark Company of Salem, Ohio, inform us that they are enlarging their works by the addition of 6000 feet of floor space. In addition to other equipment which the extension will necessitate purchasing, the company are now in the market for an extra strong 36-inch squaring shear capable of shearing  $\frac{3}{8}$ -inch plates. The company are general plate and sheet metal workers.

Engine builders report an excellent condition of business. The present business, it is said, consists mainly of smaller orders, but it is also stated that there are a large number of inquiries at hand which call for large units.

One engine builder stated that he was figuring on some large jobs and another said that he had just given out figures on upward of \$200,000 worth of work. Prices are firm.

Hooven, Owens & Rentschler of 39 Cortlandt street have received an order from the Union Bag & Paper Company of Sandy Hill, N. Y., for a 400 horse-power compound condensing engine. The latter company are also installing two new paper machines and are building a new pulp mill. They are also adding extensively to their mills at Ballston Spa, N. Y. Among other orders received by Hooven, Owens & Rentschler are one 450 horse-power compound condensing engine for the Lakesville power station of the Brockton Street Railway Company of Brockton, Mass.; a 350 horse-power simple, non-condensing engine for the Souderton Street Railway Company of Souderton, Pa., and a 350 horse-power compound condensing Corliss engine for the Thomas G. Plant Shoe Company of Boston, Mass. This concern will also install a Bulkley condenser and a cooling tower.

The Riter-Conley Mfg. Company of 39 Cortlandt street have just been awarded a contract for considerable of the machinery equipment which is to be used in the new paper mill of the Belgo-Canadian Paper & Pulp Company of Shawenagan Falls, P. Q.

In connection with the new railroad shops which are being erected at Middletown, N. Y., by the New York,

Ontario & Western Railroad the American Blower Company have just secured a large contract for heating and ventilating apparatus for the various buildings.

The latter concern also received the contract for the heating of two of the five new plants which the International Paper Company are building. The contract calls for two large blower and steam coil combinations, each to heat two buildings. They are located at Rumford Falls, Maine. The contracts for the balance of the work have not been awarded as yet.

The American Blower Company received a contract from the American Hide & Leather Company of Currensville, Pa., for one of the largest drying plants ever erected in this country. There will be three very large sets of blowers, engines and coils.

Manning, Maxwell & Moore have sold the 30-ton Shaw electric crane which was exhibited in the American Machinery Building at the Paris Exposition to Mathew & Platt of Manchester, England.

The W. P. Davis Machine Company, builders of and dealers in machine tools, engines, boilers, tools and supplies, whose works are at Rochester, N. Y., write as follows: "We have just put in a catalogue case and wish to get all of the latest catalogues on machinery and tools, as well as supplies in the line we handle. Would you kindly make a note of it that we wish to have catalogues to us from manufacturers of these articles?"

**Progress of War Ships Under Construction.**—Three of the six battle ships now under construction, the "Illinois," the "Alabama" and "Wisconsin" are reported by Chief Constructor Hichborn to be practically complete, the work done upon them ranging from 87 to 99 per cent. The "Maine" at Cramps' is set down at 38 per cent., the "Missouri" at Newport News at 19 per cent. and the "Ohio" at the Union Works at 35 per cent. All of the six sheathed protected cruisers are now under way. On the "Denver" at Neafie & Levy's 34 per cent. of the work has been finished; on the "Des Moines" at the Fore River Engine Company's, 11 per cent.; on the "Chattanooga" at Nixon's, 15 per cent.; on the "Galveston" at Trigg's, 4 per cent.; on the "Tacoma" at the Union Works, 11 per cent., and on the "Cleveland" at Bath, Maine, 31 per cent. The four monitors are set down as from 45 to 74 per cent. advanced, and the torpedo boats and destroyers are now all under construction, and range from 6 per cent. in the case of the "Decatur" to 99 per cent. in the case of the "Goldsborough," "Bailey" and "Lawrence."

**The American Brass Foundry Company.**—At Hyde Park, Mass., there are being erected a factory and machine shop by the American Brass Foundry Company which is expected to be in operation by January 1, 1901. The officers of the company are experienced in this line of business. R. P. Moseley, secretary and treasurer, was for many years with the Brainard Milling Machine Company; W. S. Carpenter, superintendent, was with the Vulcan Foundry Company, Pawtucket, and J. W. Scully is general manager. The company expect to manufacture electric railway supplies and make Babbitt, brass and composition castings.

H. K. Porter Company of Pittsburgh, builders of light locomotives, are building a compressed air locomotive for Iona Island, N. Y., to furnish motive power for cars containing ammunition under contract with the United States Government. The new locomotive is said to be one of the largest of its kind ever built. It will run several miles without being recharged, and can be charged with air at any one of the numerous stations in less than 30 seconds. There being no fire about the locomotive there is no danger of an explosion.

The Kelly & Jones Company of Greensburg, Pa., with offices in Pittsburgh, have received an order from the Japanese Government for four carloads of steam fittings to be used in the construction of plants for the drying of silk cocoons.

## The Price Schedule on Plates.

On December 7 the following prices were agreed upon on plates. It is understood that the export trade, as well as the Pacific Coast, is free territory:

	Cents.
New England (except Eastern Ship Building Company), Virginia (except Newport News Ship Building Company, and Alexandria), Illinois (except Chicago), city of St. Louis, American Ship Building Company, West Superior, Wis. ....	1.60
New York (east of Rochester), New Jersey (except Camden), Kentucky, Indiana, and Eastern Shipbuilding Company ....	1.58
New York (Rochester and west of Rochester), Ohio (except points taking 10c. freight or less) ....	1.52
Pittsburgh and Allegheny (points in Ohio, Pennsylvania, Maryland, West Virginia, taking 10c. freight or less, Pittsburgh price plus actual freight) ....	1.40
Pennsylvania (east of Altoona), city of Detroit, Maryland, District of Columbia, Alexandria, Va., Delaware, West Virginia, Camden, N. J., and Newport News Ship Building Company, cities of Chicago and Milwaukee, Michigan (except northern peninsula) ....	1.55
South Carolina, Florida, Mississippi River points in Iowa and Mississippi, Minnesota, Tennessee (except Memphis), Wisconsin (except American Ship Building Works at West Superior, and Milwaukee) ....	1.70
New Orleans and Memphis ....	1.65
North Carolina, Iowa (except river points), northern peninsula of Michigan ....	1.75
Georgia, Alabama, Mississippi (except river points) ....	1.80
Nebraska, Missouri (except river points), Arkansas, Louisiana (except New Orleans) ....	1.85
Kansas, Galveston and Houston, Texas ....	1.90
Texas (except Galveston and Houston) ....	2.10
South Dakota ....	2.20
North Dakota and Oklahoma ....	2.30
Wyoming, Colorado, Utah, Montana, Idaho, Arizona, Nevada, Pittsburgh price plus actual freight or not included.	
Pacific Coast, not included.	
All prices based on carloads. Less than carloads, \$5 per 100 pounds additional. All prices delivered f.o.b. cars or docks. Extras to be added to base price (per pound) of plates:	
Tank, ship or bridge quality, $\frac{1}{4}$ inch thick on edges, 100 inches wide and under, is taken as a base.	
Percentage as to overweight on plates, whether ordered to gauge or weight, to be governed by American Manufacturers' Standard Specifications, thickness being determined by gauge on the edge of the plate.	
	Cents.
For widths over 100 inches up to 110 inches ....	0.05
110 inches up to 115 inches ....	0.10
115 inches up to 120 inches ....	0.15
120 inches up to 125 inches ....	0.25
125 inches, by special agreement.	
For plates under $\frac{1}{4}$ inch on edges, but not under 3-16 inch. ....	0.05
For plates under 3-16 inch, 10 cents extra.	
For sketches and circles, including all plates not strictly rectangular ....	0.10c.
(Except taper plates, not under 30 inches wide at the small end, and where difference in width is not over 4 inches, for which there will be no extra.)	
For boiler and flange steel ....	0.10c.
For marine, A. B. M. A., and ordinary fire box steel ....	0.20c.
For still bottom steel ....	0.30c.
Shell grade of steel is hereafter to be abandoned.	

## Consolidation of Chicago Machine Tool Dealers.

One of the most important transactions in the machine tool business in the Northwest that has taken place in the year was the combination effected last week between two of the largest dealers in the country. The houses thus consolidated into one concern were the Marshall & Huschart Machinery Company and the firm of J. B. Doan & Co., both of Chicago. The Marshall & Huschart Company have handled the machine tools of the Cincinnati machine tool builders and have worked up a large business in the last two or three years that the company have been in operation, a Cincinnati man, Frank M. Huschart, being one of the organizers of the company. The firm of J. B. Doan & Co. have been the exclusive representatives at Chicago of the American Tool Works Company of Cincinnati. In the combination of the two concerns Mr. Huschart drops out of the business, which will be continued by the others already in the two enterprises. A stock company will be formed and the capital will be sufficiently large to enable the company to carry a full line of the goods that will be sold and do an extensive business. The name of the company has not as yet been determined upon. The company will have branches in Cincinnati and Cleveland for

the sale of the tools built by the Cincinnati Milling Machine Company, the Bickford Drill & Tool Company, R. K. LeBlond Machine Tool Company, the Cincinnati Planer Company, the Lodge & Shipley Machine Tool Company and others. The new company will have the exclusive agency of the concerns named in the cities mentioned. The deal was concluded in Cincinnati at a meeting of the representatives of the manufacturers and the dealers.

## Trade Publications.

**Gas and Gasoline Engines.**—We have received from the Charter Gas Engine Company of Sterling, Ill., catalogue describing their gas and gasoline engines. This presents a very complete description of the several types of engines built by them in large and small units.

**Steam Pumps.**—A neat catalogue of the Union Steam Pump Company of Battle Creek, Mich., describes their various types of steam pumps. The Moore steam pump has a positive steam actuated valve and noiseless steam cushion for the piston, and is peculiarly simple in its construction. The steam valve is placed on the body part of the piston within the steam cylinder, with head supplied with suitable metal packing rings. Within the body of the piston are the steam ports, leading to each end of the cylinder, registering alternately with the annular grooves of the valve in its actuation. The longitudinal sliding motion of the valve on its seat is limited between the piston heads, the valve being carried on its reciprocation by the piston until its head passes the steam inlet port in the center of the steam cylinder, thus admitting steam between the valve head and the piston head, and forcing the valve against the opposite head, changing the relation between the annular grooves in the valve and steam ports in the piston, thereby causing a reverse motion of the piston, the steam thence passing through the hollow piston rod into the exhaust chamber between the stuffing boxes. By reason of the two steam ports in the valve seat being of different areas the piston recedes gradually for a moment and then completes its stroke.

**Electric Steering Gear.**—The Electric Dynamic Company, 224 Ionic street, Philadelphia, have prepared a catalogue dealing with their electric steering gear for steamships. The company have already equipped five of the vessels of the Imperial Russian navy with this form of gear, among them the cruiser "Variag," which was recently completed by the Cramps, and which is the fastest of her type in the world. The company also have under way at their works electric steering gears for the Russian battle ship "Retvizan," now building at the Cramps, and also for one of the new vessels of the International Navigation Company. This system permits of the absolute and accurate control of the rudder and its quick manipulation. The parts are extremely simple in design and construction, with no chance of their becoming disabled. Further than this is the extremely low cost of operation, since the only constant expenditure of energy is that used for rotating the armatures of the generator and exciter through dead fields.

A press dispatch from Los Angeles, Cal., states that at a meeting of the officials of the Los Angeles & Salt Lake Railroad on that date a contract had been awarded for 8000 tons of steel rails at \$26 a ton to the Colorado Fuel & Iron Company. The name of the railroad was also changed to the San Pedro, Los Angeles & Salt Lake Railway. The company will build large machine shops, and the town of Redlands, Cal., will make a strong bid for them.

The American Bridge Company will erect a railroad bridge over the Ohio River at Neville Island, for the Pittsburgh & Lake Erie Railroad Company, to connect with the new blast furnaces being erected by the American Steel & Wire Company on Neville Island. It will be recalled that the false work of this bridge was swept away recently by floods.

The Monongahela Connecting Railroad have placed an order for about 400 tons of steel rails with the Carnegie Steel Company.



# HARDWARE.

## ✓ The Cast Iron Soil Pipe Pool.

The formation of a pool which comprises practically all the manufacturers of Cast Iron Soil Pipe, as referred to fully on following pages, has interest for the trade beyond that which attends the control of the market in an important line. It illustrates certain tendencies and influences which are operative in other directions.

When the Central Foundry Company were organized in July, 1899, it was thought by the promoters of the concern that they would have a free and undisputed field in which they could control the market for Cast Iron Soil Pipe and Fittings. The men who inspired and engineered the combination imbued the bankers who financed the company with the idea that large profits would be realized by the consolidation of all the manufacturers of this commodity. It was explained that with the control of all the plants new prices would be announced and new regulations as regards shipments and freight allowances would be made, which would leave considerable profit to the interested parties. It was expected that a considerable saving would be made by having all shipments made from local foundries, and as no competition was to be expected for some time, prices could be made which would be satisfactory to the jobbers and at the same time net a handsome return for the promoters.

It is understood that for a little while after the formation of the trust this condition of affairs actually existed, but in a very short time other manufacturers sprang up, attracted by the imaginary profits which the business was supposed to yield. The managers of the Central Foundry Company, as soon as competitors began to enter the field, did not lower their prices in order to prevent the newcomers from getting the business, but strictly adhered to the prices they had originally agreed upon, and in this way a large share of the trade went to the newcomers.

Instead of trying to win over trade by making concessions in prices, an arbitrary policy was pursued with those jobbers who did not place their entire business with them. This created considerable ill feeling, and acted as an incentive, both to the jobber to give his trade to the independent manufacturer and also to the independent manufacturer to protect his friend, the jobber. Special efforts were made by the outside manufacturers to get a complete line of goods, so that their trade would not be subject to the petty annoyance caused by the trust in issuing discriminating prices. The leading interest, for some reason best known to themselves, absolutely refused to recognize the independent manufacturers as being competitors worthy of their attention. They claimed that the jobbers, in order to get a proper service, would have to return to them and abide by their prices. This, however, did not happen. The independent manufacturers worked early and late, and very soon had complete lines.

The Central Foundry Company realized for the first time that prices must be reduced. Then began a fight which has continued for several months between the consolidation and the independent makers. This fight has waged so bitterly that prices were put below cost, with the idea that the smaller manufacturers would be compelled to get out of the business. This, however, was not the result. Out of this state of things came the pool.

There is no reason to doubt the correctness of the report that the pool was more needful to the consolidation than to its competitors. The aggregating of interests in this case was not a panacea for the ills of competition. Whatever may have been the advantages possessed by the dominant company, there were disadvantages which became a serious handicap. The smaller manufacturers endured more successfully than they the stress of strenuous competition.

In the enterprise with which the outside manufacturers developed and pushed for business in the face of a confident and formidable concern which assumed to dominate the situation, we have another indication that it will be a long time before consolidation will succeed in holding permanent control of the market.

The operations of the same principles will doubtless continue under the new conditions. With the advance in price, part of which is needed to cover the new expenses, it is hardly to be expected that outside enterprise will long hold aloof. The vitality and persistence of competition which called the pool into being will probably find new illustration under its encouragement.

## The Trade Outlook.

### Condition of Business.

Notwithstanding the continuance of a good general demand for Hardware, as the trade throughout the country are buying in fair quantities when the advanced stage of the season is considered, business is feeling the effect of the usual influences at this time. There is still a good deal doing in winter goods, although this is a line in which the heaviest requirements of the dealers have already been covered. The coming of cold weather stimulates trade, however, and goods that depend upon ice and snow for their sale are in demand. Holiday trade also calls for certain classes of goods which are especially suitable for presents. With these influences which tend to increase business there is the unwillingness to buy more than is necessary so near the close of the year, and there is accordingly a deferring of the placing of orders on general stocks until January opens and the results of the year's business have been determined. The condition of the market in some lines is, however, such that the larger buyers have been purchasing for next season, but in a great many cases there is a disposition to await the developments of the next few weeks before placing stock orders for the coming year.

### The Matter of Prices.

A few minor changes in price have taken place, to which reference is made below. The tone of the market as a whole is firm and prices as a rule are quite steadily maintained. The slight reductions made in the prices of certain goods are not regarded as indicating any general tendency toward weakness. There are a good many lines the prices of which are being revised, and with the change which has taken place in the market for raw material it is feasible to make some concessions in the prices of the finished goods. The general tone of the market is excellent and confident expectations are expressed on all sides that a large and profitable business will be done next year.

## Special Reports.

### Chicago.

(By Telegraph.)

Inventory season and the homecoming of traveling salesmen to arrange for the coming year will have some effect in reducing the volume of business in the Hardware trade, but the demand keeps up surprisingly well. This month will undoubtedly go down into history as the best December the Chicago Hardware trade has ever known. The consumption of all kinds of Hardware is evidently on a scale which is much in excess of any-

thing previously experienced. Manufacturing interests drawing supplies from the jobbers are actively employed and continually making purchases of new material. Notwithstanding the advancing tendency in Iron and Steel some irregularities are still observed in certain classes of goods. Considerable thought is being bestowed on the probable course of prices in the new year, but it is not believed that any decline is to be expected in the near future. Such changes as may be made are regarded as more likely to be advances than declines. The Heavy Hardware jobbers report a continued excellent trade in their line, and make the statement that much more business could be done in Iron and Steel if more rapid deliveries were being made by the mills.

#### St. Louis.

While giving full recognition to the demand for holiday goods, the trade state that orders for staple articles are being received in large numbers. In this respect it is said that the same general line which has been in action for the past few months still figures prominently. Builders' Hardware is ordered in fair quantities, considering the season. Steel Strap and T Hinges, Loaded Shells, Shot, Revolvers and Steel Traps are in excellent movement. Some future business is coming to jobbers, particularly on Wire Cloth, Screen Doors and Poultry Netting. There is said to be some disposition to hold back Wire Cloth orders in the expectation of lower prices. It is claimed, however, that the activity in the Wire trade holds out no encouragement for declining values. The tonnage of Wire Nails and Barb Wire involved since last report is said to be undiminished. Altogether the sales of general Hardware thus far foreshadow a gross business for December equal to that of November. In Heavy Hardware a slight cessation of business, due to the usual yearly stock taking of manufacturers, is experienced. Jobbers report, however, that it is a matter of surprise to notice the large number of inquiries which have been received.

### Notes on Prices.

**Wire Nails.**—The demand for Wire Nails shows little diminution in volume, notwithstanding the lateness of the season. There is also an increased desire on the part of carload buyers to place contract orders at present prices. Quotations are as follows, f.o.b. Pittsburgh, terms 60 days, or 2 per cent. discount for cash in 10 days:

To jobbers in carload lots.....	\$2.20
To jobbers in less than carload lots.....	2.25
To retailers in carload lots.....	2.30
To retailers in less than carload lots.....	2.40

**New York.**—Small lots of Wire Nails from store are not in quite so active demand as a week or two since, yet the volume of distribution is considered satisfactory. Prices are as follows:

To retailers, carloads on dock.....	\$2.48
Small lots at store.....	2.55

For nearby delivery of small lots 5 cents per keg extra is charged.

**Chicago, by Telegraph.**—Very heavy business continues to be enjoyed in Wire Nails by manufacturers. Some of the orders recently received are among the largest ever placed. Specifications on contracts are large. The capacity of factories is reported to be tested to the utmost. Manufacturers look for some diminution in the demand from this time, owing to the approach of the inventory period and wintry weather, but it is amazing how well the demand has kept up. No change in prices is yet announced, but an early advance is talked of. Jobbers are having a satisfactory trade from stock. Prices are held at \$2.35 for carloads, with the usual advance for small lots.

**St. Louis.**—Some very heavy business is still being placed for Wire Nails. The buying is on more liberal lines and the ordinary season limit on this item is practically lost sight of. Price remains at \$2.40, base, in carloads to retailers; \$2.45, base, for smaller quantities.

**Pittsburgh.**—Demand for Wire Nails continues heavy

and the outlook is very promising. The various Wire Nail mills of American Steel & Wire Company are all in operation and full of work, and the same is true of small concerns. There has been no intimation as yet of any advance in price of Nails. We quote, f.o.b. Pittsburgh, terms 60 days, or 2 per cent. discount for cash in 10 days:

To jobbers in carload lots.....	\$2.20
To jobbers in less than carload lots.....	2.25
To retailers in carload lots.....	2.30
To retailers in less than carload lots.....	2.40

**Cut Nails.**—Cut Nails are receiving their proportion of orders, which keep up in fair volume. Rumors of irregularity in prices, which have been in circulation in the Eastern market for a week or more, are attributed to sales of a certain brand of Iron Nails, which have not proved entirely satisfactory. The market is referred to as firm at the following quotations, f.o.b. Pittsburgh, terms 60 days, 2 per cent. off in 10 days:

Carload lots.....	\$1.95
To jobbers in less than carload lots.....	2.00
To retailers in less than carload lots.....	2.10

**New York.**—The local Cut Nail market continues in about its previous condition. Demand is fair and is considered satisfactory. Prices are as follows:

To jobbers in carload lots on dock.....	\$2.13
To jobbers in less than carload lots on dock.....	2.18
To retailers in less than carload lots on dock.....	2.31
Small lots from store.....	2.25

**Chicago, by Telegraph.**—The demand for Cut Nails keeps up remarkably, considering the lateness of the season. Jobbers quote \$2.25 for small lots from stock.

**St. Louis.**—In Cut Nails the demand is keeping up nicely, the smaller sizes, especially Shingle Nails, being in good demand. Jobbers' price ranges from \$2.30 to \$2.40, base.

**Pittsburgh.**—A very satisfactory demand for Cut Nails is reported by the mills, and the tone of the market is strong. We quote, f.o.b. Pittsburgh, terms 60 days, 2 per cent. off in ten days, as follows: Carload lots, \$1.95; jobbers, less than carload lots, \$2.

**Barb Wire.**—Conditions vary in different portions of the country regarding the requirements for Barb Wire for immediate shipment. Inquiries are being received looking to placing contract orders for next year's delivery. Export demand is good. Quotations for domestic trade are as follows, f.o.b. Pittsburgh, net cash 60 days, or 2 per cent. discount for cash in 10 days:

To jobbers in carload lots, Painted.....	\$2.50
To jobbers in carload lots, Galvanized.....	2.80
To jobbers in less than carload lots, Painted.....	2.55
To jobbers in less than carload lots, Galvanized....	2.85
To retailers in carload lots, Painted.....	2.60
To retailers in carload lots, Galvanized.....	2.90
To retailers in less than carload lots, Painted.....	2.70
To retailers in less than carload lots, Galvanized...	3.00

Ellwood and Baker Wire is 5 cents and Washburn & Moen Glidden 10 cents per 100 higher than the foregoing prices.

**Chicago, by Telegraph.**—Manufacturers report a large trade in Barb Wire and Woven Fencing. Heavy shipments of Barb Wire are being made to the Southwest, and the demand for Woven Wire Fencing is exceptionally active for the season. A good movement of Barb Wire is still reported from the stocks of the local jobbers. Prices are \$2.70 for small lots of Painted and \$3 for Galvanized Barb Wire from stock, with the usual reduction on carload lots.

**St. Louis.**—No abatement is yet seen in dealers' orders for Barb Wire. The movement to local points is excellent and trade from nearby States is strong. Painted in carloads to retailers is \$2.70; smaller lots, \$2.75. Galvanized is 30 cents higher.

**Pittsburgh.**—Domestic demand for Barb Wire has fallen off considerably, but export demand continues heavy. For domestic trade we quote: Galvanized Barb Wire, \$2.80, in carload lots to jobbers, and Painted, \$2.50. Terms 60 days net, 2 per cent. discount for cash in 10 days, f.o.b. Pittsburgh.

**Plain Wire.**—No falling off in the demand for Plain



Wire is reported. Quotations are as follows, f.o.b. Pittsburgh, terms 60 days, or 2 per cent. off for cash in 10 days:

	Base sizes.	
	Plain.	Galv.
To jobbers in carload lots.....	\$2.15	\$2.55
To jobbers in less than carload lots.....	2.20	2.60
To retailers in carload lots.....	2.25	2.65
To retailers in less than carload lots.....	2.35	2.75

The above prices are for the base numbers, 6 to 9. The other numbers of Plain and Galvanized Wire take the advances indicated in the following table:

Plain Fence Wire Advances (Catch Weights).			
Nos.	Base	Galvanized.	
6 to 9.....		\$0.40 extra.	
10.....	\$0.05 advance over base.....	.40	"
11.....	.10 " " " ".....	.40	"
12 and 12½.....	.15 " " " ".....	.40	"
13.....	.25 " " " ".....	.40	"
14.....	.35 " " " ".....	.40	"
15.....	.45 " " " ".....	.75	"
16.....	.55 " " " ".....	.75	"
17.....	.70 " " " ".....	1.00	"
18.....	.85 " " " ".....	1.00	"

For even weight bundles, 50 pounds or over, 5 cents per bundle advance on above.

**Chicago, by Telegraph.**—Manufacturers and jobbers are having an excellent trade, and manufacturing consumers are working up larger quantities than usual. Small lots, Chicago delivery, are selling at \$2.35, base.

**Pittsburgh.**—We continue to note a good demand for Plain Wire, which, however, may fall off on account of breaking up of the weather. Prices are unchanged, and we quote:

	Plain.
To jobbers in carload lots.....	\$2.15
To jobbers in less than carload lots.....	2.20
To retailers in carload lots.....	2.25
To retailers in less than carload lots.....	2.35

Galvanized Wire up to No. 14 is 40 cents advance on Plain, Nos. 15 and 16, 75 cents advance, and Nos. 17 and 18, \$1 advance. Terms are 60 days net, with 2 per cent. discount allowed for cash if paid in 10 days from date of invoice.

**Steel Squares.**—A slight reduction has been made by the associated manufacturers in the prices of Steel Squares. The published discount is now 70 per cent., an extra 10 per cent. being readily obtainable.

**Chisels and Drawing Knives.**—For some time there has been more or less irregularity in the prices of Chisels and Drawing Knives, and this has not been all traceable to the cutting on the part of the jobbers, many of whom have, however, been underselling the regular association prices quite freely. The manufacturers have been conferring in regard to the situation and have reached an agreement in regard to prices which they expect to be adhered to. A discount of 70 and 10 per cent. has been determined on as the regular price.

**Twist Drills.**—A reduction of about 5 per cent. has been made in the price of Bit Stock and Twist Drills. The market on this line is regarded as in good condition, with an excellent demand.

**Cordage.**—No change has taken place in manufacturers' prices for Rope during the past two weeks. The market is not quite so strong as it was at that time owing to the natural shrinkage in demand incident to the season. Carload buying has now almost disappeared, but the distribution of Rope for the last few months is referred to as exceeding that of former years. Quotations for small lots are as follows: Manila, 10 cents per pound on the basis of 7-16-inch and larger; Sisal, 7 cents per pound on the same basis.

**Cast Iron Soil Pipe.**—On a following page we refer at length to the Cast Iron Soil Pipe market, noting the formation of the pool and giving information in regard to the prices which have been determined upon.

**Glass.**—Various reports are in circulation regarding independent manufacturers coming to an agreement among themselves, and the effect such an agreement would have on the trade in general. One of the reports is that in case the independents formed an association, the product of all the factories would be disposed of

through a sales agency. Another report is that in case an association of independent factories is formed the disposition of independent Glass would be put in the hands of the American Window Glass Company. In either event it is considered probable that an advance in price would result. Stocks of Glass in the hands of local jobbers are moving slowly, resulting in some unevenness in prices. It would appear that somewhat the same conditions prevail in the West, as the prices given below have been made for immediate acceptance, for shipment at the option of the sellers, within 90 days, upon specifications meeting the sellers' approval, freight to be equalized under the same conditions prevailing with the American Window Glass Company. The quotations are as follows, terms 60 days, or 2 per cent. discount for cash in 10 days:

*In Lots of 500 to 1000 Boxes.*

Single Thick, first bracket.....	.85 and 15 %
Single Thick, second and third brackets....	.85 and 20 %
Single Thick, above.....	.89 and 5 %
Double Thick, first five brackets.....	.88 and 5 %
Double Thick, 60 and 70 inch brackets.....	.89 and 5 %
Double Thick, above.....	.90 and 10 %

*In Lots of 1500 to 3000 Boxes.*

Single Thick, first bracket.....	.85 and 20 %
Single Thick, second and third brackets....	.85 and 25 %
Single Thick, above.....	.90 %
Double Thick, first five brackets.....	.89 %
Double Thick, 60 and 70 inch brackets.....	.90 %
Double Thick, above.....	.90 and 15 %

*In Quantities Exceeding 3000 Boxes.*

Single Thick, first bracket.....	.85 and 20 %
Single Thick, second and third brackets....	.85 and 25 %
Single Thick, above.....	.89 and 10 %
Double Thick, first five brackets.....	.89 and 2½ %
Double Thick, 60 and 70 inch brackets....	.90 and 2½ %
Double Thick, above.....	.90 and 15 and 2½ %

Regular quotations are as follows: For carload lots jobbers quote manufacturers' prices, with 5 per cent. added. Discounts for small lots from the jobbers' list of September 1, which are uniform over the entire country, are as follows:

All single strength.....	.85 and 25 %
All double strength.....	.85 and 25 and 5 %

**Paints and Colors.**—**Lead and Zinc.**—Demand for White Lead in Oil for consumption this season is about over. For spring delivery orders have been placed with corrodors by jobbers to a large extent. Quotations remain unchanged as follows: In lots of 500 pounds and over, 6½ cents; in lots of less than 500 pounds, 7 cents per pound. Dry French Zinc has been reduced in price as follows: In barrels of 220½ pounds net, Antwerp Red Seal, 6½c. per pound; Antwerp Green Seal, 7¼c. per pound.

**Oils.**—**Linseed Oil.**—The Linseed Oil market is in a weak and unsatisfactory condition, demand being confined to small lots for immediate delivery. Large buyers are holding off, and few, if any, contracts for future delivery are being entered. Independent crushers of State and Western Oil have reduced their price for carload lots to 55 cents per gallon without attracting business. Quotations are as follows: City Raw in lots of five barrels or more, 60 cents per gallon; in lots of less than five barrels, 61 cents. State and Western are held at 58 cents per gallon for small lots. Boiled Oil is 2 cents per gallon extra.

**Spirits Turpentine.**—The price of Turpentine at this point has fallen off during the week 1 cent per gallon, on a dull and uninteresting market. The market is quite firm at the decline, as a further reduction in price on the part of holders might tend to keep large consumers from purchasing. These, however, are confining their orders to small lots, covering immediate requirements, as large orders might cause an advance in prices. Quotations are as follows: Southern, 41½ cents per gallon; machine made barrels, 42 cents per gallon.

The stable of the Welliver Hardware Company, Danville, Pa., was recently destroyed by fire and two fine horses destroyed.

## CAST IRON SOIL PIPE POOL.

THE manufacturers of Cast Iron Soil Pipe and Fittings have succeeded in forming a pool to market their products. All prices, freight allowances and shipments will be under the direct control of the secretary of the pool. For several months past it has been a matter of common knowledge that the manufacturers of these goods were not making any profit on their business. In fact it has been said that all of the manufacturers were losing money, and the greater business that they did resulted in greater losses. For some reason the Central Foundry Company refused to recognize the independent concerns as being competitors worthy of their attention. They let themselves believe that they were the only serious factor in the business, claiming that the independent concerns did not make a full line and could not give the jobbers or the trade satisfactory service. They held aloof from the independent concerns and would not meet them or agree to any prices or any allotment of territory, and as a result they have been fought to a standstill by the outside manufacturers. They have now agreed to stand shoulder to shoulder with the others and maintain prices and freight and shipping regulations. We understand that this change of position was brought about through the dictates of the bankers who financed the Central Foundry Company when they came into being a year ago last July. It is understood that the profits realized by the company were not what the promoters expected they would be. For a little while after the formation of the combination they had everything their own way as regards prices and terms, but in a very short time independent foundries sprang up on all sides, so that at the present time there are 10 or 12 strong, well capitalized competitors who have to be recognized as factors in this line of business.

In order to conciliate the different elements in the line and put the business on a paying basis, overtures were made to George F. Ross, the former secretary of the Central Supply Association, who have their offices in Chicago. Mr. Ross was induced to take a position with the Central Foundry Company as assistant general manager, and it is understood that it is owing to his efforts that the various manufacturers have now come together and agreed to pool their interests. Efforts have been under way for the past two or three weeks to bring this about, and at a meeting which was held last Tuesday, December 4, at the office of the Central Foundry Company, the deal was consummated whereby all the manufacturers agreed to maintain prices and abide by certain rulings and regulations in regard to shipments and territory.

The pool is formed upon what is known as a tonnage basis—that is to say, each manufacturer will be allowed to make and market a certain number of tons of Soil Pipe and Fittings, upon which he will pay into the pool a certain percentage of his receipts. As soon as he reaches the amount allotted to him he will have to stop manufacturing and turn the business over to another member of the pool, or else continue to manufacture and pay a higher percentage of his receipts into the pool. The percentage which each manufacturer is to pay into the pool is so large that it prevents him from cutting prices beyond those agreed upon, and it also prevents him from manufacturing a greater quantity than that allotted to him, unless he chooses to do it at a loss to himself.

Prices will not be uniform throughout the country, but will vary in the different sections. Special prices have been issued for the territory of Greater New York. The same prices do not obtain in New York State and in the New England States as are ruling in the Metropolitan district. New Jersey and Pennsylvania have separate prices. The Southern, Western and Southwestern States have also their own prices.

New prices were announced December 4, which show an advance of 12½ per cent. over the previous quotations, which have been in effect and have ruled since August 1, 1900. The jobbing trade was not apprised of the intentions of the manufacturers, and the amount of business taken from the trade was restricted to a minimum.

No member of the pool was allowed to book orders which could not be filled prior to December 31, 1900, and with the advent of the new year all the manufacturers of Cast Iron Soil Pipe and Fittings will have a clean order book, and all business after that date will be at the prices announced on December 4, which are as follows, terms 60 days, or 2 per cent. discount for cash in 10 days:

### Greater New York Discounts.

Shipments to Greater New York, which includes New York, Brooklyn, Jersey City, Hoboken and Newark.

2 to 6 inch Standard Pipe.....	70 and 5 %
2 to 6 inch Extra Heavy Pipe.....	75 and 5 %
2 to 6 inch Fittings, Standard and Extra Heavy.....	80 %
7 to 8 inch Pipe and Fittings, Standard and Extra Heavy .....	65 and 10 %
10, 12 and 15 inch Pipe and Fittings, Standard and Extra Heavy.....	65 %

*Freight Allowances.*—On all carload lots to Greater New York full freight will be allowed.

Less than carload lots to Greater New York, f.o.b. foundry.

### New York and New England Discounts.

2 to 6 inch Standard Pipe.....	70 %
2 to 6 inch Extra Heavy Pipe.....	75 %
2 to 6 inch Fittings, Standard and Extra Heavy, .....	75 and 10 and 5 %
7 to 8 inch Pipe and Fittings, Standard and Extra Heavy .....	65 and 10 %
10, 12 and 15 inch Pipe and Fittings, Standard and Extra Heavy.....	65 %

*Freight Allowances.*—On all carload shipments in New York State and the New England States special freight allowances will be made according to the point to which the goods are to be shipped.

Less than car lot shipments in the above mentioned territory are f.o.b. foundry.

It is understood that every Soil Pipe and Fittings plant in the entire country is in the pool, and it is said that the pool was formed in such a way and on such a firm basis that considerable profit is expected to accrue to the various concerns comprised in it. The following concerns are said to be in the pool:

Abendroth Brothers, New York.  
 Bessemer Soil Pipe Company, Bessemer, Ala.  
 Chattanooga Pipe & Foundry Company, Chattanooga, Tenn.  
 Hercules Iron & Supply Company, Anniston, Ala.  
 Independent Foundry Company, Portchester, N. Y.  
 McElwaine-Richards Company, Indianapolis, Ind.  
 National Foundry Company, Brooklyn, N. Y.  
 Ronalds-Johnson Company, New York and Hainesport, Pa.  
 L. Wolff Mfg. Company, Chicago, Ill.  
 N. O. Nelson Mfg. Company, St. Louis, Mo.  
 John Simmons Mfg. Company, New York, with foundry at Newark, N. J.  
 Central Foundry Company, controlling the following soil pipe plants:  
 Henry McShane Mfg. Company, Baltimore, Md.  
 J. Register & Sons, Baltimore, Md.  
 Monitor Iron Works, Newark, N. J.  
 Monitor Iron Works, Sing Sing, N. Y.  
 A. L. Swett Iron Works, Medina, N. Y.  
 Bignall Mfg. Company, Medina, N. Y.  
 Beach & Co., Medina, N. Y.  
 Midvale Foundry Company, Allentown, Pa.  
 Phoenix Foundry & Mfg. Company, Lansdale, Pa.  
 Wilmington Pipe & Foundry Company, Wilmington, Del.  
 Shuster Foundry Company, South Pittsburgh, Tenn.  
 Alabama Pipe Company, Bessemer, Ala.  
 E. L. Tyler & Co., Anniston, Ala.  
 Hoffman, Billings & Weller Company, Gadsden, Ala.  
 Rundle-Spence Mfg. Company, Milwaukee, Wis.  
 Bell Mfg. Company, Vincennes, Ind.  
 Humphries Mfg. Company, Mansfield, Ohio.  
 Ahrens & Ott Mfg. Company, Louisville, Ky.

In one of the Special Notices in this issue a traveling salesman of long and successful experience offers his services to manufacturers after January 1. The advertiser, who signs himself "Executive Ability," is now connected with a prominent house and is favorably known to the trade.

Bright & Co., wholesale and retail Hardware, Stoves, Sporting Goods, Mill Supplies, &c., Reading, Pa., have put in two new elevators and are making a number of improvements in their retail department.



## British Letter.

FROM A SPECIAL CORRESPONDENT.

### James Keeves & Son.

A PROMINENT firm handling American Hardware is that of James Keeves & Son of Calvert avenue, Shoreditch, London. They do not stock heavy metals but deal in light and domestic Hardware only. The firm are a typically English one. They are 52 years old, and for 40 years traded on the old English conservative lines. They were Hardware factors for a small number of large houses and contentedly jogged along, more or less indifferent to the signs of the times.

Fifteen years ago Mr. Keeves, Sr., was making a comfortable living out of six customers. He had a son, James Keeves, who seems to have been impregnated with modern sentiments, and he immediately started in and made things hum. After a few years' drumming James Keeves, Jr., settled in the warehouse and became his own buyer. In a few years' time he had completely revolutionized their old fashioned trade. The result has been that in 12 years' time the number of their customers has increased from six to over 3000. Ten years ago the turnover was \$75,000; to-day it is \$500,000. When we remember that this large amount is entirely made up out of light, cheap Hardware, your readers will understand that it means an exceptionally big business.

Another point that James Keeves, Jr., insisted upon was that the old dilatory methods of trade must go by the board; and he now makes it a boast that every order coming into his establishment is dispatched the same day. He says: "I execute my orders promptly and I expect firms who supply me with Hardware to be equally prompt. I do not ask for impossibilities; all I ask is that if they undertake to deliver goods into my establishment by a certain day they keep their promise without excuses. Modern business takes no stock in excuses."

James Keeves & Son are well acquainted with American goods and sell quite a quantity, which they buy almost entirely through London agents. In going over their enormous warehouse I was struck with this fact. A large stock of Stanley Shelf Brackets could be seen, Awls and Tools galore, made by Fray; Hinges of all sorts by various American makers; Wooden Handles for every kind of implement; Washboards, Clothes Pegs and American light Woodware generally.

Referring to a certain manufacturer I asked him if he would like to deal direct with such a house and he said: "I have no objection whatsoever. It suits my convenience to buy through agents, but I always carry on my business 'without prejudice,' as the lawyers say. We generally contrive to sell everything we buy. Of course we make mistakes and sometimes we discover that some of our purchases are 'cold pork.' I assure you we clear out our 'cold pork' with startling promptitude. If it does not show signs of selling, out it goes, no matter what the loss may be.

"I like American goods. We thought we knew something about light Hardware in this country, but I soon discovered that our very lightest Hardware was almost heavy compared with some goods that we now get from America."

Notwithstanding the fact that they have repeatedly extended their premises they are considering another extension which is to cost \$100,000. Here certainly is a firm with no prejudice against but, on the contrary, with rather a partiality for American goods.

### The Dutch Boycott in South Africa.

My previous announcement as to the formation of a Dutch company in South Africa has been quoted on this side. There has been some incrudulity, but nobody has ventured to deny the statement. I am now in a position to go a little further. The *modus operandi* is to be as follows:

In all the Dutch settlements throughout South Africa stores are to be organized somewhat on a co-operative basis. These stores are for the purpose of catching the Dutch trade. A large proportion of the Hardware dealers, grocers, chemists and other traders in South Africa at the present moment are English and

Scotch. The intention is by means of these stores (which are to sell everything) to cut out the English traders. I am not in the least concerned to justify this policy, but it is my business to make known the facts.

In conversation yesterday with a gentleman who is going out to South Africa in connection with this scheme I was able to verify my previous statement that American goods would be welcomed. They want all sorts of Agricultural Implements, Corrugated Roofing, Barbed Wire and Wire, Builders' Hardware, to say nothing of the usual domestic appliances.

At the present time ten of these stores have been started as a beginning, and several more are in process of formation. At the right time a large wholesale distributing center will be started in a central place, to which all goods will be consigned. I feel bound to record my own personal opinion that the gentlemen at the back of this movement mean business. They have capital; but the future is on the laps of the gods.

### Walter P. Notcutt.

Walter P. Notcutt, who has extensive connections as a Hardware agent, sails for New York on December 19, to meet any American manufacturers who want to start business over here. Mr. Notcutt does business entirely on commission; does not ask for expenses, but will not handle any line unless he can sell it. He employs personally six travelers, who cover the Southern parts of England and works in conjunction with Mr. Beebee of Manchester, practically on partnership lines. The Manchester house, in its turn, employs another half dozen travelers, so that the whole of Great Britain is thus covered. In addition to this Mr. Notcutt has just completed arrangements with a Belfast house and is therefore represented all over Ireland, where he tells me that already he has been successful in doing business. Walter P. Notcutt believes in American Builders' Hardware, and says he can sell in good quantities.

### Requests for Catalogues, &c.

THE Hardware and House Furnishing establishment of the Stambaugh-Thompson Company, Youngstown, Ohio, was almost completely destroyed by fire on the 3d inst., the loss being \$75,000 to \$100,000, principally in stock; fully covered by insurance. The house is a large one, and the loss will be severely felt, coming as it does just on the eve of the holiday trade. The chief damage is on stock by smoke and water, the building itself being but slightly injured. The fire originated in the basement in the Paint department among Oils and Varnish, from an unknown cause. Most of their catalogues were destroyed, and the company advise us that they would be very glad to receive catalogues and discount sheets from both manufacturers and jobbers. Their line covers Hardware, House Furnishing Goods, Iron and Steel, Steam Fittings, Cordage, Mill Supplies, Mantels, Stoves, Plumbing and Heating, &c.

Walter E. Williams, San Diego, Cal., has added a full line of Shelf Hardware to his former Stove and Tinware stock. Mr. Williams would be pleased to have catalogues sent to him by the jobbing trade.

### The Edwin Bell Company.

AT a meeting of the stockholders of the Edwin Bell & Sons Company, Youngstown, Ohio, held on the 17th ult., it was unanimously determined to change the name of the concern to the Edwin Bell Company, taking effect December 1. The change of name involves not the slightest change in the status of the company, all contracts and obligations now existing continuing in as full force and effect as if no change had been made. It was also determined that their large and increasing business demanded an office in Pittsburgh, Pa., which office was opened on the 1st inst. It is located at their extensive plant on Seventeenth street, South Side. The establishment of this office will enable the company to more nearly concentrate the management of their numerous mills and factories and have them more directly under personal control, thus insuring prompt and efficient service to their customers.





## With Santa Claus in a Hardware Store.

If Santa Claus were turned loose in Gross' Big Hardware Store, what a bulging sack he would stagger away under!

What's here for him?

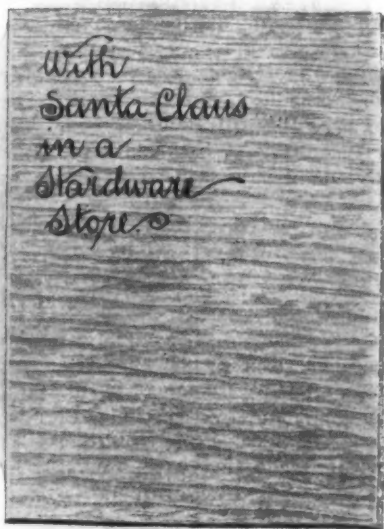
LISTEN:

Knives for every one in the family for one thing, for a boy isn't the only one who likes a Christmas Knife.

Girls too—and mothers, have many uses for a Knife.

So he would likely begin on Knives—and he could begin at 5c. and buy them all the way up to \$12.00—all sorts of handles.

And we would give him a guarantee with every last one of them. And when he got his Knives all bought we'd show him the



Razors and he could buy them safely here, too.

There is an old joke you remember about the man who found a "RAZOR SET" at his plate on Christmas and tried to "look pleasant." A Dry Goods Store Razor with a whole outfit, cup, strop, soap and all—and a bargain at 99c.!

This man would have smiled and felt pleasant indeed, if it had have been one of the Gross Razors, though.

For he comes here, himself—for his.

So—if Santa Claus needs Razors,—here they are from \$1.00 to \$5.00 with handles of pearl, silver and rubber.

Star and Gem Safety Razors,—\$1.50.

In combination Sets from \$4.50 to \$15.00.

Next!

Scissors and Manicure Sets.

Another time when Santa Claus will do well to leave it to us, to supply the genuine Articles.

Those sold on Bargain Counters are generally on a par with the "Razor Sets"—and are a Nuisance—as far as cutting is concerned—in almost every instance.

Scissors will cost the old man from 25c. to \$2.00.

Fancy Scissors in cases from \$1.50 to \$10.00.

## With Santa Claus in a Hardware Store

Showing how the "Old Man of Christmas" would fare, if he came to Gross' to load his pack.

BY

The Phillip Gross Hardware Co.

126-128 Grand Avenue

'Phone Main 1116. MILWAUKEE

"With the Compliments of the Season"

Manicure Sets \$3.50 to \$15.00.

But they will be Worth While.

Before he leaves the Cutlery Cases, he'll see the Carvers—these are from \$1.00 to \$25.00. The silver plated Knives and Forks from \$1.50 to \$15.00. The pearl handled



## With Santa Claus in a Hardware Store

IF Santa Claus were turned loose in Gross' Big Hardware Store, what a bulging sack he would stagger away under!

What's here for him?

LISTEN:

Knives for every one in the family for one thing, for a boy isn't the only

Knives and Forks \$10.00 to \$18.00. The Fish, Bird and Game Sets \$1.25 to \$5.00. The Fruit and Dessert Knives 50c. to \$5.00.

And he'll be caught by the Chafing Dishes—a whole case of them from \$2.75 to \$12.00.

And from that he'll wander to the Coffee and Tea Pots, the Creations of French, Russian, Vienna and American workmen.

And right back of him he'll bump into a Case filled with Guns and Rifles—and he'll lay down his pack again.

He'll need a number of Rifles.

We'll show him the "Killdeer" at \$3.00 that shoots a 22 and "does business," or some accurate shooting Air Rifles at 75c. to \$2.50, and keep on till we have gone all through the Marlin, Winchester and Henry Repeaters—that'll bang! bang! bang! for 27 times, before they quit,—these costing from \$10.00 to \$25.00; or if he thinks a good old "Parker" double barreled Gun, or some other equally famous make, would be better, all right, but why not both?

The old man is trying to save plenty of room for the Skates, both ice and roller, and so away we go to the Skate Department and he sees that he'll have another big job ahead of him to pick between 50c. and \$6.00—but that's the range, and he will have need of some of each kind.

The Sleds, Tool Chests, Scroll Saws, Manual Training Tools, Drawing Instruments, Bicycles, Punching Bags, Boxing Gloves, Footballs, Whitely Health Exerciser. Then there are Fancy Beer Steins, to put in the "Den," at 25c. up to \$10.00. Carpet Sweepers to save mother's back when she has to follow the little "bread and butter" fellows who strew bread Crumbs all over the Carpets;—these are from \$1.50 to \$3.50; pretty Dog Collars for "Fido"—("Fido" wants to celebrate Christmas too)—from 25c. to \$5.00. Bird Cages, that will make the canary whistle a new Christmas Carol the moment he "moves in" to his new house—(Bird Cages, 50c. to \$5.00.) Sleigh Bells to let the neighbors know you are coming to help them celebrate, from 50c. to \$10.00. Chinese Dinner Gongs, from \$1.25 to \$10.00.

All these and a hundred other things we'll bring up and show to the old man, and nearly drive him to the point of distraction before he gets away—and as he loads his heavy sack we'll hear his good natured chuckle as he says to himself—

"Ach Himmel, I never did think before, There were so many gifts in a Hardware Store."

"If It's from Gross' It's Good."

### The Electric Wheel Company.

THE ELECTRIC WHEEL COMPANY, Quincy, Ill., manufacturers of Solid Metal Wheels, Farmers' Handy Wagons, &c., issue a new catalogue showing the various styles of Wheels made by them. This style of Wheel is intended both for ordinary and extra heavy service. The Wheels are made in various diameters, from 20 to 60 inches, carrying tires from 1½ to 8 inches in width. Extra strong Wheels are guaranteed to carry 8000 to 12,000 pounds. The company state that they are prepared to furnish complete Trucks for gasoline engines, made entirely of steel with steel wheels, axles and steel channels, or with steel wheels, hickory axles and wooden timbers, or with steel wheels, steel axles and wooden timbers, the purchaser furnishing the box seat or platform floor to suit himself. They can also furnish Wheels of any size and width of tire, to fit any axle and carry any weight. A separate circular shows their Wheels in use in Cuba and Mexico and different parts of the United States.

### Production.

*Address of Henry R. Towne at the banquet of the National Hardware Association at Richmond:*

This friendly gathering of those who make and those who distribute one of the staple products of the country is typical of the co-operative spirit and tendency of our times. From one viewpoint we may be divided into hostile camps, separated by the proverbial antagonism of the buyer and seller, but from another and better viewpoint we are seen to be more truly friends and allies, copartners in supplying to the people a product which, if not among the largest, is certainly among the most essential of those which enter into the upbuilding of their homes, their workshops, their places of business, of pleasure and of occupation of every kind, and which includes also a vast number of articles otherwise essential to their comfort and convenience.

#### MERGING INTERESTS.

In inviting me to address this meeting you suggested that I should speak from the standpoint of the manufacturer, and an experience of over 30 years as such may perhaps have given me some qualification to do so, but, frankly, I confess that as my experience has broadened I have found the dividing line between the field of the producer and that of the distributor to become steadily less well defined, and their mutual interdependence steadily more apparent. Trained and educated as an engineer and engrossed for many years in the manufacturing department of the business with which my name is associated, naturally I came to regard the work of production as pre-eminently important, and that of distribution as secondary and subsidiary. With added years of experience I have revised, if not reversed, that judgment.

#### POTENTIALITY OF LABOR.

The poetic fancy that in every block of marble there lies imbedded a statue of fairest shape which awaits only the sculptor's chisel to become a reality, may be paraphrased by stating that in all raw material there lies the potency of value awaiting only the quickening touch of human labor to become a substantial fact. Indeed, it is to labor, and to labor only, that is due the ultimate and practical value of all material. The ore in the iron mine, untouched by labor, is merely inert matter, so much dirt, useless and valueless except for the potentiality which only labor can realize. Mined and brought to the surface it acquires its first value, and may perhaps be worth \$2 a ton. Loaded and transported to the furnace, perhaps a thousand miles away, the added labor gives added value, making it possibly worth twice as much; transformed by the furnace into pig metal its value trebles and becomes \$12 or \$15. Transformed again by the alchemy of the Bessemer converter into a steel billet its value rises to say \$20. Converted again into steel rails or beams its value becomes \$25 or more. Rolled into rods and wire it is worth from \$40 to \$400 per ton, while converted into watch springs it may become worth more than \$20,000.

At each and every stage the increment of value represents the increment and sum of the labor which has been necessary to produce the result attained, including not merely the so-called productive labor of the workman, but equally the labor involved in transportation and distribution, and, above all, the intellectual labor involved in creating and directing the complex organizations by which the results have been accomplished. It is not sufficient that the producer should create the finished products from the raw materials, it is equally essential that the carrier should transport and deliver them to the places where needed, and that the distributor or merchant should furnish them at the time and in the quantities required. Throughout these complex processes, from end to end of the chain, it is labor, whether in its higher or its lower forms, which, starting from nothing, creates and builds up value. The pearl of the sea, the gold in the bowels of the earth, the ore in the mine, have no effective value until brought by human labor under man's domination and use.



## THE DISTRIBUTER INDISPENSABLE.

Granting these facts, self evident but not always recognized, does it not follow that in the creation of values the contribution of the distributor is as essential, if not always as large, as that of the producer? What would it advantage the latter to produce if he could not dispose of the product? Of what value would it be to accumulate the product at the mine or the factory if it could not be transported thence and distributed among the vastly scattered army of consumers? This trend of thought and sequence of events applies not only to the products of our mines, but, equally, to those of our fields and factories, our fisheries and to all of the endless industries of our land.

## PRODUCERS, CARRIERS, DISTRIBUTERS CO-EQUALS.

Dwelling on these facts I have learned to appreciate and respect the carrier and distributor as co-equals and copartners of the producer. Each is essential to the others; none could exist but for the co-operation of the others. Hence, as a manufacturer, I have learned to esteem the merchant, whether jobber or retailer, as a friend, associate and ally; and I avail gladly of this opportunity and of this presence to state the fact, to declare my faith and to express the belief that the best interests of manufacturers and merchants alike will be served by reunions of this kind, which tend to draw us into closer and friendlier bonds.

## IMPORTANCE OF HARDWARE.

Turning now to our own specialty, Hardware, which we make and you distribute, do not these arguments apply to it with peculiar force? Of all the many groups into which staple products are divided, few cover equal and none a greater diversity. To meet the demands of his customers a Hardware dealer, large or small, must gather together the products of scores or even of hundreds of factories, many of the latter, in turn, making lines of almost endless diversity, so that his stock represents the work of innumerable crafts, and its intelligent handling requires a high degree of technical knowledge in many fields of industry and applied science.

Above all, it represents a combination of products of vastly greater variety than that of any single manufacturer, yet all harmonious and many of them closely related. No manufacturer of Hardware could successfully seek the consumer direct, even in the larger cities only, to the exclusion of the dealer, for none of them makes but a small fraction of the enormous variety of goods constituting a general line of Hardware, and the consumer, needing Hardware of various kinds, would decline to buy piecemeal from many separate sources what he could purchase with far greater convenience from a single merchant. But the ultimate market for the manufacturer lies not merely in the larger cities, but, still more, in the thousands of smaller towns and villages, and in the crossroads country stores, to reach all of which would require a distributing organization so vastly beyond his individual ability as to be impracticable and unattainable.

## MANUFACTURERS' DEPENDENCE ON THE DEALER.

Hence it follows that we manufacturers of Hardware are as absolutely dependent on you distributors for the marketing of our product as you, in turn, are dependent on us for the supply of merchandise with which to stock your shelves and fill your orders. Out of these conditions arises a mutual dependence which cannot too strongly be emphasized, which should draw us into close and helpful alliance, and which is typified by the cordiality with which the National Hardware Association has invited manufacturers to participate in its annual meetings.

## THE EVOLUTION OF A CENTURY.

The century which is closing covers the most wonderful period in the world's history, and is truly the Age of Romance, for it has seen greater wonders than all the preceding epochs since history began. At its opening the steam engine had but been conceived and modern science was in its infancy. Among its creations are the steamboat, the railroad, the telegraph, the telephone, the cotton gin, the power loom, the sewing machine, the

typewriter, the use of gas, the utilization of electricity for light and power, the creation of the steel industry and, above all, the concentration of human energies into larger and larger units, with a vastly more than proportionate increase of efficiency and decrease of cost, which has resulted in a gain in earning power, and in an ability of the people to command and enjoy the comforts of life, greater than was even dreamed of in earlier ages.

## CONCENTRATION.

This tendency to concentration is as apparent in our trade as in others, although retarded in some degree by the obvious and permanent necessity of continuing to reach the scattered consumers of sparsely settled sections through the agency of innumerable small dealers and the general store of the country crossroads. In all of its primary phases, however, both of production and distribution, the tendency in this, as in other industries, is plainly toward larger units. Nor should this tendency be regretted or opposed. While possibly involving temporary hardship to individuals, it makes, directly and unquestionably, for the benefit of the many, and is simply one of the features included in the general progress of the world toward the reduction of costs and the increase in the purchasing power of wages.

Evolution implies always, and of necessity, the confronting of new problems and these, in turn, often give rise to conditions which, at first and for a time, may bear hardly on some of those concerned, but out of this conflict of opposing interests there is always evolved, surely though slowly, a permanent gain for the community. The locomotive displaced the stage coach, involving temporary hardship to those who had maintained the latter; the sewing machine displaced the old time needle woman, to her temporary loss but ultimate gain; the modern machine tool forced the old time artisan to drop his hand implements and to become a machinist, thereby ultimately raising his wages and vastly increasing his efficiency. So likewise in distribution, the business formerly done by the peddler and small shopkeeper has passed from them into larger and more capable hands and is concentrating more and more into the great warehouses of the jobber and the spacious and attractive store of the large retailer. It is urged that this tendency is depriving the small shopkeeper of his living, but more frequently it is true that it offers him relief from care and the opportunity to earn a better living as the head of a department in the larger organization. Whether so or not, it unquestionably operates to reduce the cost of distributing goods and thus benefits the community. In the end, whatever makes for the benefit of the community benefits the individual and will surely prevail. It would be as futile to oppose this tendency to concentration, with all of the increased efficiency and economy which it implies, as it was to oppose the introduction of the locomotive or the power loom, and the concentration of the individual workmen and workwomen into the modern factory.

## GROWTH OF PRODUCTION AND DISTRIBUTION.

This tendency to concentration began and is still most apparent in production. The reduction of costs thereby accomplished has vastly cheapened prices of every important product, and is a chief factor in opening the markets of the world to the products of American labor. But the same progress has long been in progress in the field of distribution, as may be seen by comparing the volume of business transacted now and in former years by the members of your association. In primary distribution—i. e., in the field of the jobber, concentration is as inevitable and as expedient as in production. In the secondary or ultimate field of distribution, however, that occupied by the retail trade, while the tendency to concentration prevails in the large cities, it is obvious that there will always remain the need of a vast number of small distributors, scattered throughout the country to be within easy access of the ultimate consumer, and each occupying usefully and profitably its own legitimate field. Even so, however, these widely scattered distributors are not beyond the reach of substantial benefit from the prevailing tendency to co-operation to which I have referred, and already these interests, per-

ceiving this fact, are seeking to utilize it by the organization of trade associations intended to adjust the relations and promote the interests of their members.

#### COMPETITION.

It is an old saying that "competition is the life of trade," but in our day we have learned that it may become the ruin of the trader. Worse than this, I believe that it is, in a vast number of cases, a direct tax on the community. I realize that here I am venturing onto new and possibly dangerous ground, but I have long believed that the conditions under which business of many kinds is now conducted are crude and wasteful, and ultimately will be superseded by others of higher and better form, with corresponding benefit to the community. Business follows the lines of least resistance, and if cheaper and more efficient methods of doing business are possible they will surely be discovered and adopted.

#### EXPENSIVE DISTRIBUTION.

To illustrate my meaning I will refer to facts which have fallen under my personal observation. A few years ago in a certain country town I noted three adjacent stores, each occupied by a separate proprietor, for the sale of shoes, there being other shoe stores in other parts of the same town. It was obvious that the combined business of all could readily have been transacted by any one of the three without any increase in the expenses of the one beyond the possible addition of a few clerks. Each supported a family and several employees, the probable average being six or eight persons supported by each store. If this support was to be obtained it was obvious that the goods must be sold at a corresponding advance over cost. If this result was accomplished I contend that an involuntary tax was thereby imposed on the local public by forcing the latter to pay a higher price for shoes than would have been necessary under a better method of distribution. As a matter of fact the problem solved itself, the competition proved ruinous, and two of the stores finally disappeared, leaving the survivor in possession of the field. Undoubtedly the concentration of business thus automatically effected enabled the latter, if so disposed, to sell profitably at a smaller advance over cost, and such reduction of prices, if made, directly benefited the ultimate consumer. In this case concentration was the outcome of competition, and possibly all progress in this direction will thus be accomplished by the automatic action of economic forces, but it is conceivable that, as the science of self government develops it may be found advantageous and feasible to foster and promote by legislation tendencies of this kind which make for the common good.

#### A LESSON FROM THE POSTAL SERVICE

A striking illustration of this possibility exists in the case of our postal service. I well remember the existence, in my youth, of proprietary agencies for the distribution of local mail in the larger cities. Abundant records of this fact may be found in the albums of stamp collectors, among whose most cherished treasures are the stamps issued by Blood's Penny Post in Philadelphia, and by like concerns in other cities. The general Government, perceiving at last the fact that in thus leaving the least expensive field of operations to private enterprise, and in restricting its own functions to long distance service, it was foregoing a legitimate source of income, suppressed by legislative enactment the proprietary agencies and merged their business with that of the general postal service.

As we all know, the result has been a vast improvement in the service, and those who have studied the facts know also that the receipts from the local business of the large cities now constitute one of the principal sources of revenue to the Post Office Department, and were a chief factor in making possible the reduction of postage to the 2 cent rate.

#### LEGISLATION OF THE FUTURE.

We have here a striking illustration of the advantages of concentration, and a demonstration of the proposition that, under some conditions at least, it may be expedient and justifiable to promote concentration by legislative

enactment. I believe it well within the possibilities of the future that, as the science of distribution becomes more highly organized and developed, as it surely will be, it may be found equally expedient and justifiable to undertake in other directions its regulation, by local or general laws, and with equal benefit. Whether so or not, however, self interest, guided by the constantly accumulating fund of experience, will surely tend, from year to year, both in production and in distribution, to seek the advantages of concentration and of friendly co-operation as a substitute for the crude, unregulated and often disastrous conditions of competition which now exist. Believing these things, I respect and indorse the purposes for which your organization is formed, and I rejoice to see the growing tendency to organize State and local Hardware associations, the influence of which I believe will surely be to diminish the unquestionable evils of a competition which, in too many cases, we know has been ruinous to those who are directly concerned, and, in the end, unprofitable to the community.

#### MANUFACTURER ; JOBBER ; RETAILER

I am prompted in this connection to refer briefly to a topic of perennial interest in the trade—viz., the relations of the manufacturer, the jobber and the retailer. Each of these three is essential to the other two. I have already alluded to the mutual dependence of the manufacturer and retailer; in my judgment the jobber is equally essential to both. However possible or necessary it may be for the manufacturer to deal directly with the retailer in the larger cities, it is a physical impossibility for him to deal directly with the vast army of small retailers in the more scattered communities, or for them to supply their wants, small perhaps in value but numerous in kind, directly from the manufacturers.

I have heard it said that the day of the jobber is past; on the contrary, I believe that he is more essential now than ever before, and will always be necessary. If these are the facts, if the jobber is essential alike to the manufacturers and to the vast army of small retailers, it follows that the jobber should be duly recognized and adequately compensated for his services. To this proposition the retailer objects that it thereby imposes a tax on him; on the contrary, it merely recognizes an existing and inevitable fact. The retailer serves the needs of the consumer by gathering together on his shelves the vastly diversified products of many factories which constitute a general line of Hardware, thus enabling his customer to purchase the kinds and quantities of goods he may want when needed and at his convenience. In like manner the jobber serves the needs of the retailer by gathering together in his warehouse all of the hundreds of thousands of articles which the retailer needs to purchase, and by enabling the latter to obtain these as required at a minimum of trouble and expense. If the jobber were eliminated and the retailer were obliged to maintain his stock by drawing directly from the factories in which the goods are produced, the cost to him would be far greater than the moderate commission charged by the jobber for his services. Indeed the jobber is a standing illustration of the possibilities and benefits of concentration.

Therefore, the value of the jobber, both to the manufacturer and to the retailer, thus being established, I believe that it should have frank and fair recognition; that the manufacturer should so adjust his scale of prices as to provide a compensation to the jobber which will cover the reasonable expenses of the latter and a fair profit; that the retailer, recognizing these facts, should cease to oppose the maintenance of a fair differential in favor of the jobber; that the manufacturer should avoid deliberate encroachment on the legitimate field of jobbing enterprise, and that if these conditions can be generally established and maintained they will remove many of the causes of friction which now exist and will permanently promote the best interests of all concerned.

I thank you, Mr. President, and the members of the National Hardware Association, for the opportunity of meeting with you on this occasion, and, especially, for the privilege of expressing my views concerning the trade in which we are all engaged, and in conclusion I



venture to hope that the suggestions I have offered for your consideration may, in some small degree, tend to promote our mutual interests.

### J. Stevens Arms & Tool Company's New Departure.

THE J. STEVENS ARMS & TOOL COMPANY, Chicopee Falls, Mass., have decided to manufacture Bicycles in their hill shop, formerly the factory of the Overman Wheel Company, for the market of 1901. Ever since the company came into possession of the Overman plant last March there has been a flow of inquiries from former agents for the Victor Bicycle and other friends of the wheel in regard to whether or not the manufacture of the wheels, interrupted by the failure and assignment of the Overman Company, would be resumed. This led to the beginning of experimenting with materials and designs. Some time ago circular letters were sent out to test the probable demand of the trade, and ascertain the ideas of the agents of what an up to date Victor wheel should be. The replies were very favorable and a good deal of loyalty was evidenced by former Victor agents, nearly all of whom expressed their willingness to take on the new wheel. Arrangements are now under way for turning out the wheels. No particular increase in the number of hands at the hill factory will be made at present, as the busy season for the other departments of the company is just closing, and a good many men will be transferred from the Gun to the Bicycle department. In regard to the probable quality of the new wheel, it is stated that it will fully sustain the reputation of the Victor wheel and that of the company who will now engage in its manufacture. The company are going at it in a conservative manner and will aim simply to meet the present demand, and to work it up slowly, but steadily. They will spare no pains to make a success of the undertaking.

Under its new management the business of the J. Stevens Arms & Tool Company has grown remarkably during the last five years, which time has elapsed since the new régime was inaugurated. Then the river factory employed but 30 men and was but one-fourth of its present size. Three large additions have been made during the past year. Including the hands at the hill shop, the company now employ 450 to 500 men. They will still continue to be known chiefly on account of their line of Tools and Firearms. The Bicycle business is distinctly a new venture, and for the present will be followed in a limited way. The head of this department of the company will be Duffield Miles of Chicopee Falls, who has had a large practical experience. Mr. Miles has been with the Spalding Bicycle concern for the last eight years, and before the transfer of their sales department to New York was superintendent of agencies. For two years previously he was connected with the Overman Wheel Company.

### Wrightsville Hardware Company.

WRIGHTSVILLE HARDWARE COMPANY, Wrightsville, Pa., have made several additions to their plant. A new foundry 180 x 50 feet has been built, and a new cupola, ratters, overhead trolley system and hoisting apparatus have been installed, making it a most complete modern plant. This improvement enables the employment of 50 additional molders, making the number now employed over 100. A 65 x 40 feet addition has been made to the grinding and polishing department, and additional machinery installed. This latter improvement was made necessary by the heavy increase in the demand for Mrs. Best's Improved Cold Handle Sad Irons. These Irons have now been patented in the United States, England and Germany, and application has been made for patents in France and Austria. Foreign trade with the Wrightsville Hardware Company has been exceptionally good. A large order for Sad Irons was recently taken, on which one shipment of 2500 sets has already been made, and further shipments of like quantity are to follow shortly. The foreign trade has grown so rapidly, we are advised, that it now takes nearly one-half of the output of the plant. The home

trade also holds up well, inquiries being good and many satisfactory orders being taken. One of the recent ones that may be noted is for 10,000 Tobacco Cutters of special design. These are for the American Tobacco Company, and one carload composed of 2500 of these Cutters has already been shipped.

### The Boss Mfg. Company.

THE BOSS MFG. COMPANY, manufacturers of Husking Goods and Workmen's Gloves and Mittens, Kewanee, Ill., have greatly improved their plant to keep pace with the continuous growth in their trade. The company have enjoyed a much larger business this season than ever before. They began 12 years ago to make Husking Pins, employing but four hands. Their business has now grown to such magnitude that they are enabled to keep 250 persons busy in the height of the season. In one day the past fall they shipped seven carloads of Husking Goods. The prospects were never brighter for the increase of their trade, and they are making preparations to be able to handle it.

The factory of this company is a large three story brick building, with a separate three story brick building used for the office and special purposes hereafter enumerated. The factory comprises a number of operations in distinct lines, but all related. The company aim to make everything they use as far as possible, but are purchasers of large quantities of canton flannel and other cotton goods which they use in making cheap Mittens: Leather of different kinds to be used in making leather Gloves, Wrist Straps, &c.; and Steel in Strips, from which they manufacture Husking Pins, Hooks and Rivet Washers. They further purchase great quantities of the small Rivets which are used for re-enforcing Husking Gloves and for attaching straps to leather goods. Everything else they manufacture themselves. The different departments in which these materials are prepared for finishing are supplied with much special machinery to secure rapid production with the most economical use of labor. Machinery is brought into play wherever possible to use it to advantage. Power machines with knives of proper shape cut many thicknesses of cloth or leather at one operation. Portions of the establishment are filled with sewing machines, operated by power, which enable such sewing as is done to be performed very rapidly. Other departments are partly fitted with benches supplied with small anvils at which riveting is done, but also with riveting machines. A machine shop with a fine equipment of tools is kept constantly employed in not only making repairs but in building special machines. This shop contains a number of presses which are used in punching hook and pin blanks from steel strips and forming them into finished shape. A machine of the company's own design and construction is used for making buckles. The company also do their own nickel plating and tin plating. The past year they built a new engine house and put in a new 100 horse-power Atlas engine to supply the increased power necessary. They are now adding to their boiler plant and are extending their facilities in practically every department. They not only have their own electric light plant, but furnish light to another establishment at a considerable distance. A complete Bell telephone system is just being installed to connect the different departments with the office.

The office building, which was formerly a one-story structure, has had two more stories added this year. These stories are devoted to the special interests of the employees. The top floor is supplied with chairs and tables and is daily used as a dining room, while it also serves as a place for social gatherings. The company believe that their interests are best served by doing what they can for the comfort and pleasure of their employees. During the summer months they change their daily hours so that by working a little longer for five days in the week the employees are given the benefit of a Saturday half holiday. The second story of this building is also largely given to the use of the employees, containing toilet rooms and other conveniences.

The company's products consist of about half Husking Goods and half Gloves and Mittens. The Husking

Goods have always been marketed through the Hardware trade, but the Gloves and Mittens until recently were sold through dry goods houses. The Hardware trade, however, have taken hold of these quite largely of late and the tendency is steadily toward the acquisition of this branch of their business by Hardware merchants.

### Kokomo Wire & Nail Company.

THE KOKOMO WIRE & NAIL COMPANY, Kokomo, Ind., have this week started their new plant, operating at the beginning on Wire Nails alone. Next week they expect to have their full plant in operation drawing Wire, and making Barb Wire, Nails and Woven Wire Fence. About January 15 they expect to begin to manufacture a full line of Farm Fencing for the trade. They also expect by that time to be regularly producing miscellaneous and Market Wire. They claim to have the most modern and best equipped Nail and Wire mill in the West. The plant has been highly praised by experts who have visited it. They have equipped the Nail factory with the latest improved Nail machines. The president of the company is A. A. Charles; secretary, J. E. Fredrick; treasurer and general manager, Harry Ward.

### A New Shovel Plant.

WE can state that a number of capitalists of Youngstown, Ohio, are organizing a company for the purpose of going into the manufacture of Shovels of all kinds on an extensive scale. The new plant will be located in Youngstown proper or in one of its suburbs. The material to be used in the making of Shovels can be procured from several sources in Youngstown.

### Cincinnati Screw & Tap Company.

THE CINCINNATI SCREW & TAP COMPANY, manufacturers of Set, Cap and Machine Screws, Bolts, Nuts, Rivets, Taps, Dies, &c., Cincinnati, Ohio, are enlarging their plant by an additional story, which will give them extra floor space 50 x 170 feet. They contemplate re-equipping the entire plant with new and modern machinery in all departments. This move has been under consideration for some time, owing to the increased business enjoyed by this company.

### Refrigerator Notes.

Grand Rapids Refrigerator Company, Grand Rapids, Mich., have issued their catalogue of Leonard Cleanable Refrigerators for the season of 1901. Attention is called to some new points brought out for this season, among which are the Leonard Sliding Adjustable Shelves. These Shelves are a combination of sliding shelves and adjustable shelves, which combination has for the first time been made by this company and is patented. The Shelves have no screws or locks of any kind and are adjustable to any height without the aid of tools. The lines illustrated in this catalogue of 124 pages comprise the company's standard Refrigerators in a great variety of constructions, the white enamel lined, the porcelain lined, the Polar Star porcelain lined, the Champion, the Nickeloid and special constructions for the use of grocers, butchers and other tradesmen. An appendix to the catalogue presents a number of specialties also manufactured by the company, such as Catalogue Cabinets, Electrotape Cabinets, Game Boards, &c., and further gives valuable suggestions to merchants with regard to methods of advertising and selling Refrigerators.

Herrick Refrigerator & Cold Storage Company, Waterloo, Iowa, have issued what they term their miniature catalogue of the Herrick Sanitary Refrigerator. This Refrigerator carries the ice in the upper left hand corner. There is a partition (which extends from nearly the top to nearly the bottom) in the center of the Refrigerator for the purpose of separating the cold air from direct

contact with the warm air, thus establishing, it is stated, a good circulation of cold, dry air. The Refrigerators are spruce or enamel lined and for fine trade they have an opalite lining, which is seamless, with no screws or nails visible. The company state that they do not sell to department stores and are soliciting the legitimate trade only, one agent in a town.

Belding-Hall Mfg. Company, Belding, Mich., have issued separate catalogues relating to the Belding New Perfection and National dry air, charcoal sheathed Refrigerators, Ice Chests, Grocers' Sectional Refrigerators, &c. The company have added to their line two handsome new counter butter exhibit Refrigerators, which are made of quarter sawed oak. The company refer to business last year as the largest in their history, and have increased their capacity for the present season.

Heinz & Munschauer, Buffalo, N. Y., are issuing their 1901 illustrated catalogue of the Zero and Buffalo Refrigerators, Ice Chests, Grocers' Refrigerators, &c. Their Zero line is fitted with a device for removing the flues in the provision chamber, permitting the Refrigerators to be easily cleaned throughout. Charcoal is used in the filling as a purifier and absorbent of gases.

The Niagara Refrigerator Works, Buffalo, N. Y., have issued their catalogue and price-list of Niagara and Erie Refrigerators for the coming season. The Erie is not equipped with the patented features of the Niagara, but is referred to as one of the best and handsomest low priced Refrigerators.

The Michigan Barrel Company, Grand Rapids, Mich., have issued their catalogue of Yukon Economic and Chilkoot Refrigerators, comprising 58 pages. It gives a full description of the methods adopted in the manufacture of the company's Refrigerators. The catalogue contains illustrations of the leading styles made by the company, together with full descriptions. These Refrigerators are all made of hard wood. The Yukon line has removable flues. They manufacture both zinc lined and white enameled provision chambers and also furnish removable ice chambers with some sizes.

### Trade Items.

THE SCHATZ HARDWARE COMPANY, Mt. Carmel, Conn., have recently been incorporated under the laws of West Virginia, with a capital of \$10,000. They will manufacture Hardware Specialties and Special Tools principally. Smith & Hemenway, 296 Broadway, New York, are financially interested in the company and will market their product.

THE TORRENT PUMP & FENCE COMPANY, Cleveland, Ohio, have recently been incorporated with a capital stock of \$30,000. As soon as architects can finish the plans they expect to begin the construction of a large addition to their plant, in which they will install a new outfit of machinery particularly for the manufacture of the Torrent Purifying Pump. The company are also manufacturers of the Rogers Fence Machine. Joseph Allen, 7 and 9 Warren street, New York, represents the company in Eastern territory and for export.

MANUFACTURERS of Hardware desirous of being directly represented in Great Britain will be interested in the Special Notice in this issue signed "W.," care of this office. The advertiser has been established in London for many years, and has lately opened a branch office in Manchester to facilitate trade in the northern districts. It will be observed that the advertiser announces his intention of visiting this country from December 26 to January 18, so that those who desire it may arrange for a personal interview.

THE Special Notice on another page signed "F.," care Charles Austin Bates, Vanderbilt Building, New York, relates to a well established and, we understand, successful business in one of the Middle Western States. The stock comprises complete lines of Hardware, Farm Implements, Buggies, &c., and the opportunity merits the attention of those looking for an investment of this character.



### Among the Hardware Trade.

E. S. Decow has succeeded E. S. Decow & Co., Sault Ste. Marie, Mich.

Boutelle & Patten, Pasadena, Cal., have disposed of their Hardware and Stove business.

A. E. Emerson, Rowan, Iowa, has purchased O. E. Ballou's Hardware stock and consolidated it with his own.

Geo. C. Fetterman has embarked in business at Delamar, Nev., handling Shelf and Heavy Hardware, Stoves and Tinware, Agricultural Implements, Sporting Goods, &c.

G. W. Wilson & Co., Denton, Texas, will be succeeded January 1, 1901, by R. S. Taylor & Son.

The Fribley Hardware & Implement Company, Baxter Springs, Kan., have disposed of their Hardware department to J. A. Eriksen.

Dinsmore & Miller, in the Hardware business at Scottsburg, Ind., have sold out to W. F. Rice.

Thompson & Juve have lately entered the Hardware, Stove, Agricultural Implement and Sporting Goods business in Baltic, S. D.

Hood & Clelland are successors to D. W. Snider & Co., Fairmount, W. Va.

T. Coke Chambers has bought the Hardware business formerly conducted by Samuel Armstrong, Camden, Del.

W. E. Sullivan, dealer in Hardware, Agricultural Implements, Stoves, Paints and Oils, &c., North Creek, N. Y., is contemplating the erection of a new building.

M. W. Arnold, Claypool, Ind., has disposed of his furniture department, and will hereafter confine his attention to the sale of Hardware, Stoves, &c.

Marr & Markle, New Hampton, Iowa, have dissolved. The Hardware and Farm Implement business will hereafter be carried on under the style of Marr Bros.

Hill Bros., for 15 years in the Hardware and Agricultural business at Carthage, Ind., have sold out to Wm. H. Sharer, who has removed to the Hill store, where his former stock and that just acquired have been consolidated.

M. W. Wooten has disposed of his interest in the Cassville Hardware Company, Cassville, Mo., to A. and Claude Hesse. The firm style will continue unchanged.

Theo. Smith & Son of Phillipsburg, Kan., have purchased the Hardware, Lumber, Coal and Farm Implement business of Hillstead & Son, Marvin, Kan., and will continue the business under that style.

F. D. Kibbey & Bro., Edmond, O. T., have sold out to Weiser & Waldorf, who will continue at the old stand.

I. Howell has sold his stock of Hardware in Neligh, Neb., to F. E. Gleseker, who will occupy Mr. Howell's building until next spring, when he will move to his own new double building, which is 48 x 90 feet, two stories high.

Mr. Carroll will withdraw from the firm of Burrell & Carroll, Canisteo, N. Y., January 1, and the business will hereafter be conducted by G. C. Burrell under his own name.

Anthony Anderson has succeeded Anderson & Sobollik in the Hardware and Stove business, at Cresco, Iowa.

The partnership heretofore existing between Hanson E. Atkins and Walter S. Whiting under the firm name of Pottsville Supply Company, Pottsville, Pa., was dissolved on the 14th ult., by mutual consent. Mr. Atkins and Henry C. Halberstadt have formed a new partnership and are continuing business under the same style.

E. J. Parker & Sons, Fairmount, Ind., have been succeeded by J. H. Parker & Son.

J. B. Davis & Son are successors to Ryan & Davis in the Hardware and Stove business in Letcher, S. D. An addition to the store, 50 x 30 feet, has recently been completed.

Advices from Los Angeles, Cal., indicate that trade in Hardware lines has been unusually good during the past few months, and continues to increase. The houses who combine jobbing with their retail trade state that their jobbing sales this year more than equal the combined business of last year. Merchants are buying freely, and instead of taking mixed carloads, as in the past, are purchasing entire carloads of certain lines. There is great activity in oil well supplies, pumping outfits and drilling rigs. Some five firms are dealing in this line, beside a number of shops and foundries who manufacture them. The principal improvement in the way of local enlargements is the new warehouse and salesrooms of the Hoffman Hardware Company, 226 South Main street. This is practically a new concern. E. A. Hoffman last year bought out the Los Angeles Hardware Company, and has increased the business to such an extent that he has been obliged to construct a new building in the rear of his store, 31 x 70 feet in plan, and consisting of four stories and basement. This firm are paying particular attention to the jobbing business along the coast, and have three or four men on the road. L. V. Funge has just opened a retail store at 437 South Spring street. He will handle domestic Hardware chiefly.

W. L. Tipton has disposed of his Hardware business in Churdan, Iowa, to W. J. Holloway.

### Miscellaneous Notes.

#### Ripley's Sprayer and Whitewashing Machine.

An improved sprayer, which is arranged to be carried by a strap over the operator's shoulders, has just been put on the market by the Ripley Hardware Company of Grafton, Ill. The special feature of this sprayer is the use of compressed air, by which it can be continuously operated without the constant pumping necessary in most sprayers. This is referred to as not only a great convenience and relief to the person using the sprayer, but as insuring a steady and uniform volume of the solution, which is always under control. The economy of solution secured by the use of the sprayer is emphasized by the manufacturers. This compressed air sprayer can be made at the will of the operator to throw a stream 30 feet high or to discharge a fine mist-like spray which reaches every part of the foliage of a plant or tree. It is easily handled and works any solution equally well. Another use for it is in whitewashing fences, buildings, cellars, stables, &c. The company also manufacture a small hand sprayer, which has a glass reservoir that cannot corrode or rust out. The small sprayer is likewise operated by compressed air. The wide use of bicycles has made air pumps easily available for such purposes as operating these sprayers.

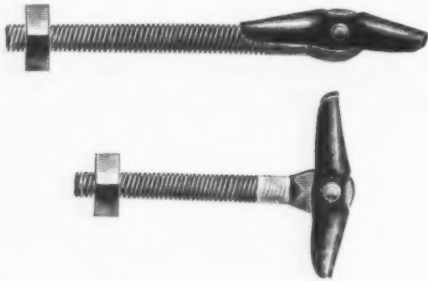
#### Enameled Ware.

The Central Stamping Company, 23-25 Cliff street, New York, have begun to manufacture a full line of double coated enameled ware in the way of cooking utensils, house furnishing goods, &c. It is their intention to produce as full an assortment as that made by any other house, of the best quality, at a reasonable price. The goods will be on the market and ready for the trade January 1 next.

McKenna Bros. Brass Company, Pittsburgh, Pa., call attention to their facilities for turning out at short notice many varieties of brass work. They state that their foundry contains a very large number of patterns from which they can generally make a selection for odd work. In their finishing shop they have all the modern styles of machines for their line of work, and their polishing and electro plating plant is equipped to do all kinds of plating, bronzing, oxidizing and special finishes.

### Toggle Bolts.

The accompanying cuts represent toggle bolts put on the market by Steward & Romaine Mfg. Company, Philadelphia, Pa. Toggle bolts are designed for use where it is impossible to use expansion bolts, and are suitable for securing brackets and electrical devices, running of wires, &c., or for fastening any fixtures to walls, ceilings, &c., constructed of fire proof material, such as tiles, marble slabs, metal ceilings, &c. The man-



Toggle or Anchor Bolts.

ufacturers state that the standard sizes of toggle bolts are carried in stock, and that samples will be sent upon application.

### The Bennett Handy Oiler.

The Bay State Stamping Company, Worcester, Mass., are offering the self-closing oil hole cover shown in Fig. 1. It is made of three pieces—a case, a valve and a spring. The valve has projecting arms to guide it centrally and allow the oil to pass by. To apply the

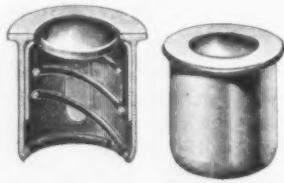


Fig. 1.—The Bennett Handy Oiler.

oil, as in Fig. 2, the oil hole is drilled the proper size, where the oiler is forced in. The oil is introduced by pressing the oil can spout upon the valve, which is closed by a spring when the pressure of the spout is removed. The oiler projects a little above the surface, making it convenient to clean and wipe over. It is made in sizes from  $\frac{1}{4}$  to  $\frac{5}{8}$  inch, with variations of 1-16 inch. The ad-

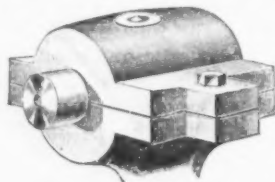


Fig. 2.—Application of Handy Oiler.

vantages of the oiler are referred to as including economy in cost and application, convenience and neatness in use and simplicity of construction.

The Nicholson File Company are about to bring out the fifth edition of their "File Philosophy," a 40-page booklet, describing the methods of filing and the uses of files. It has proved much more popular than was anticipated, and has been widely distributed over the entire world. It is furnished free upon application.

J. Stevens Arms & Tool Company, Chicopee Falls, Mass., tendered a very pleasant entertainment to their employees and invited guests on Saturday evening, 8th inst. The whole top floor of one of the buildings of their plant had been cleared out, and a stage complete with drop curtain and footlights occupied one end of it. From 7.30 to 8 o'clock there was a very enjoyable concert by the J. Stevens Band of 15 pieces. The concert was followed by a very good minstrel show. Another feature of the evening was the presentation of portraits of

Joshua Stevens and James E. Taylor to the company by the employees. That of Wm. Fay, the third founder of the company, was given to the company last year, so that the set is now complete. Mr. Stevens, who is 84 years old and now retired from active business, came from Meriden, Conn., especially for the occasion.

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# Current Hardware Prices.

REVISED DECEMBER 11, 1900.

**General Goods.**—In the following quotations General Goods—that is, those which are made by more than one manufacturer, are printed in *Italics*, and the prices named represent those current in the market as obtainable by the fair retail Hardware trade, whether from manufacturers or jobbers. They apply to such quantities of goods as are usually purchased by retail merchants. Very small orders and broken packages of ten command higher prices, while lower prices are frequently given to larger buyers.

**Special Goods.**—Quotations printed in the ordinary type (Roman) relate to goods of particular manufacturers, who are responsible for their correctness. They usually represent the prices to the small trade, lower prices being obtainable by the fair retail trade, from manufacturers or jobbers.

**Range of Prices.**—A range of prices is indicated by means of the symbol @. Thus 33½@38½&10% signifies that the price of the goods in question ranges from 33½ per cent. discount to 38½ and 10 per cent. discount.

**Cut Prices.**—In the present condition of the market there is a good deal of cutting of prices by the jobbing trade, whose quotations are often lower than those of the manufacturers.

**Names of Manufacturers.**—For the names and addresses of manufacturers see the advertising columns and also THE IRON AGE INDEX SUPPLEMENT (May 3 1900), which gives a classified list of the products of our advertisers and thus serves as a DIRECTORY of the Iron, Hardware and Machinery trades.

**Standard Lists.**—A new edition of "Standard Hardware Lists" has been issued and contains the list prices of many leading goods.

**Additions and Corrections.**—The trade are requested to suggest any improvements with a view to rendering these quotations as correct and as useful as possible to Retail Hardware Merchants.

## Adjusters Blind—

Domestic, 7 doz. \$3.00...33½@38½&10%  
North's...10%  
Zimmerman's—See Fasteners, Blind.

## Window Stop—

Ives' Patent...25&5%  
Tapiha's Perfection...30%

**Ammunition**—See Caps, Cartridges, Shells, &c.

## Anvils—American—

Eagle Anvils...7 7/4@7 7/8  
Hay-Budden, Wrought...3 1/2@4 1/2  
Horsehoe brand, Wrought...3 1/2@4 1/2  
Samson...7 1/4@7 7/8  
Trenton, Wrought...7 1/4@7 7/8  
Buel Pat. Trenton Wrought...7 1/4@7 7/8  
Vulcan Wrought...7 1/4@7 7/8

## Imported—

Armstrong's Mouse Hole...8 1/2@9 1/4  
Peter Wright's...9 1/4@10 1/4

**Anvil, Vise and Drill—**

Millers Falls Co., \$18.00...20%

**Apple Parers**—See Parers, Apple, &c.

## Aprons, Blacksmiths'—

Hull & Hoyt Co.:  
Lots of 1 doz...25%  
Smaller Lots...20%  
Lots of 3 doz...30%

## Augers and Bits—

Com. Double Spur...60¢@10¢@10¢@70¢  
Boring Machine Augers...60¢@10¢@10¢@70¢

Car Bits, 12-in. twist...60¢@10¢@10¢@70¢

Jennings' Pattern:  
Auger Bits...60¢@10¢@10¢@70¢

Ford's Auger and Car Bits...40¢@10¢@10¢@10%

Forstner Pat. Auger Bits...20%  
C. E. Jennings & Co.:  
No. 10 ext. lip. R. Jennings' list...40%  
No. 30, 10. Jennings' list...50%

Russell Jennings...35¢@10¢@10¢@10%  
L. Hommedieu Car Bits...50¢@10¢@10¢@10%  
Pugh's Black...20%  
Pugh's Jennings' Pattern...35%  
Snell's Auger Bits...60%  
Snell's Car Bits...50%  
Snell's Car Bits, 12-in. twist...60%  
Wright's Jennings Bits (R. Jennings' list)...50%

**Bit Stock Drills—**

Standard List...65¢@70%

**Expansive Bits—**

Clark's small, 1/8; large, 3/8...50¢@10%

Lavigne's Clark's Pattern, No. 1, 7/8 doz., 22¢; No. 2, 1 1/8...30¢@10%

C. E. Jennings & Co., Steer's Pat...35%  
Swan's...60%

**Gimlet Bits—**

Common Double Cut...gro. \$2.00@2.75

German Pattern...gro. \$3.25@5.00

Double Cut, makers' lists...65¢@50¢@10%

**Hollow Augers—**

AMES...95¢@10%

Bouney's Adjustable, 7/8 doz...\$15.50

New Patent...25¢@10%

Universal...20%

**Ship Augers and Bits—**

Ford's...40%

Snell's...40%

C. E. Jennings & Co.:  
L. Hommedieu's...15¢@10%

Watrous...40%

**Awl Hafts, See Hafts, Awl.**

**Awls—**

Brad Awls:  
Handled...gro. \$2.75@3.10

Unhandle, Shouldered, gro. \$3.50@3.80

Unhandle, Patent...gro. 60¢@70¢

Peg Awls:  
Unhandle, Patent...gro. 31¢@34¢

Unhandle, Shouldered, gro. 65¢@70¢

Scratch Awls:  
Handled, Common...gro. \$3.50@4.00

Handled, Socket...gro. \$11.50@12.00

**Awl and Tool Sets—See Sets, Awl and Tool.**

**Axes—**

First Quality, best brands...\$6.25@6.50

First Quality, other brands...\$6.00@6.25

Jobbers' Special Brands:  
Good Quality...\$5.00@5.50

Best Quality...\$6.25

Cheap, Handle Axes...\$5.50@5.75

Beveled, add 25¢ doz.

**Axle Grease**—See Grease, Axle.

**Axles—**

Concord, Loose Collar...4 1/2¢

Concord, Solid Collar...5¢

No. 1 Common...3 1/2¢

No. 1 1/2 Com. New Style...3 1/2¢

No. 2, Solid Collar...3 1/2¢

Nos. 7, 8, 11 to 14...75¢@10%

Nos. 15 to 18...60¢@10%

Nos. 19 to 22...75¢@10%

**Boxes, Axle—**

Common and Concord, not turned...lb. 5¢

Common and Concord, turned...lb. 6¢

Half Patent...lb. 9¢

**Balances—**

**Sash—**

Caldwell new list...50%

Fulman's...60%

**Spring—**

Spring Balances...50¢@50¢@10%

Chatillon's Light Spr. Balances...40¢@10%

Chatillon Straight Balances...40%

Chatillon Circular Balances...30%

Chatillon's Large Dial...30%

Poiseuse...50%

**Barb Wire**—See Wire, Barb.

**Bars—**

Steel Crowbars, 10 to 40 lb., per lb...5¢@34¢

**Beams, Scale—**

Scale Beams, List Jan. 12, '98...30¢@10%

Chatillon's No. 1...30%

Chatillon's No. 2...40%

**Beaters—**

Standard Co.:  
No. 5 Steel Handle Dover...gro. \$6.50

No. 10 Cast Handle Dover...gro. \$8.00

No. 10 St-el Handle Dover...gro. \$9.00

No. 15 Extra Heavy Steel Handle...\$15.00

Rival, 7/8 gro...\$10.00

Tapiha Mfg. Co.:  
No. 50 Small Family size...\$9.50

No. 100 Regular Family size...\$8.00

No. 102 Regular Family size, tinne...\$9.50

No. 150 Large Family size...\$15.00

No. 152 Large Family size, tinne...\$17.00

Lyon's, Standard size...7 doz. \$1.75

Wunder (S. S. & Co.)...\$7.50

**Bellows—**

Blacksmith, Standard List...70¢@70¢@10%

C. E. Jennings & Co., Blacksmith...60¢@10%

C. E. Jennings & Co., Hand...35¢@5%

**Blacksmiths—**

Inch...30 32 34 36 38 40

Each...\$2.70 3.95 4.55 5.10 5.70 6.55

Extra Length:  
Each...\$4.35 4.85 5.40 5.95 6.50 7.95

**Molders—**

Inch...9 10 11 12 14 16

Doz...\$6.75 7.25 8.50 9.50 12.00 14.50

**Hand—**

Inch...6 7 8 9 10 12

Doz...\$3.75 4.35 4.50 5.00 5.75 6.75

**Bells—**

Ordinary goods...75¢@75¢@10%

High grade...70¢@70¢@10%

Jersey...75¢@10%

Texas Star...50¢@10%

**Door—**

Abbe's Gong...45%

Barton Gong...55%

Gong, Yankee...55%

Home, R. & E. Mfg. Co...55¢@10%

Lever and Pull, Sargent &...20¢@10%

**Hand—**

Hand Bells, Polished...60¢@60¢@10%

White Metal...55¢@55¢@10%

Nickel Plated...50¢@50¢@10%

Swiss...60%

Silver Chime...30¢@30¢@10%

**Miscellaneous—**

Form Bells...lb. 3¢@34¢

Steel Alloy Church and School...60¢@60¢@10%

Willmot & Hobbs Mfg. Co., Gong...70%

**Belting Rubber—**

Common Standard...75¢@75¢@10%

Standard...70¢@70¢@10%

Extra...60¢@10%

High Grade...50¢@10%

**Leather—**

Extra Heavy, Short Lap...50¢@10¢@60%

Regular Short Lap 60¢@10¢@10¢@5%

Standard...60¢@10¢@10¢@70¢@5%

Light Standard...70¢@70¢@5%

**Cotton—**

Rosendale-Reddaway B. & H. Co.:  
Sphinx Brand...60¢@10%

Durable Brand...70%

**Bench Stops**—See Stops, Bench

**Benders and Upsetters, Tire—**

Green River Tire Benders and Upsetters...30%

Stoddard's Lightning Tire Upsetters...40¢@50%

**Bicycle Goods—**

John S. Leung's Son's 1899 list:  
Chain...50%

Paris...50%

Spokes...50%

Tub...50%

**Bits—**

Auger, Gimlet, Bit Stock Drills, &c.—  
See Augers and Bits.

**Bit Holders**—See Holders.

**Blind Adjusters**—See Adjusters, Blind.

**Blind Fasteners**—See Fasteners, Blind.

**Blind Staples**—See Staples, Blind.

**Blocks—**

Common Wooden...70¢@70¢@10%

Cleveland Steel...60¢@10¢@60¢@10%

Eddy's Steel...60¢@10%

Harts Steel...50¢@10%

Ford's Star Brand Self Lubricating...60¢@10%

Hollow Steel, Ford's Pat. Star Brand...50¢@10%

Lane's Patent Automatic Look and Junior...30%

Stowell's Novelty, Mal. Iron...50%

See also Machines, Hoisting.

**Boards, Stove—**

Zinc, Crystal, &c...60¢@10%

**Bolts—**

Carriage, Machine &c.—

Common, list Jan. 30, '95...70¢@50¢@10%

Norway Iron, \$3.00, list Oct. 7, '95...75¢@75¢@10%

Phila. Eagle, \$3.00 list May 24, '99...80¢@80¢@10%

Boit Ends, list Jan. 30, '95...70¢@50¢@10%

Machines, list Oct. 1, '99...70¢@10¢@50¢@10%

Note—The rapid advances in manufacturers' prices enable the jobbers to cut prices freely.

**Door and Shutter—**

Cast Iron Barrel, Round Brass Knob:  
Inch...3 4 5 6 8

Per doz...\$0.35 .55 .65 .81 .80

Cast Iron Spring Foot:  
Inch...6 8 10

Per doz...\$1.00 1.25 1.75

Cast Iron Chain, Flat, Japanned:  
Inch...6 8 10

Per doz...\$0.35 1.30 1.50

Cast Iron Shutter, Brass Knobs:  
Inch...6 8 10

Per doz...\$0.80 .90 1.15

Wrought Barrel Brass Knob:  
Inch...3 4 5 6 8

Per doz...\$0.45 .61 .70 1.23

Wrought Barrel...70¢@10¢@75¢@5%

Wrought "Bronzed...40¢@50¢@10%

Wrought Flush, B. K...50¢@10¢@60¢@10%

Wrought Shutter...40¢@10¢@60¢@5%

Wrought Square Neck...50¢@50¢@10%

Wrought Sunk...50¢@50¢@10%

Ives' Patent Door...60%

**Stove and Plow—**

Plow...60¢@10¢@10%

Stove...67%

**Tire—**

Common...70¢@70¢@5%

American Screw Company:  
Norway Phila., list Oct. 10, '94...75%

Eagle Phila., list Oct. 10, '94...77%

Bay State, list Dec. 28, '99...70%

Franklin Moore Co.:  
Norway Phila., list Oct. 10, '94...75%

Eagle Phila., list Oct. 10, '94...77%

Ellipse, list Dec. 28, '99...70%

Port Chester Bolt & Nut Company:  
Empire, list Dec. 28, '99...70%

Keystone Phila., list Oct. '94...77%

Norway Phila., list Oct. '94...75%

**Carpet Stretchers—**See *Stretchers, Carpet.***Cartridges—**

B. B. Caps, Con., Ball Supt.	\$1.30
B. B. Caps, Round Ball	\$1.12 @ 1 1/2
Blank Cartridges:	
22 C. F., 50	10¢
22 C. F., 70	10¢
22 cal. Rim., 50	10¢
22 cal. Rim., 70	10¢
Central Fire	2 1/2
Pistol and Rifle	15¢
Primed Shells and Bullets	15¢
Rim Fire Sporting	50¢
Rim Fire, Military	15¢

**Casters—**

Bed	70¢ @ 10¢
Plate	75¢ @ 10¢
Philadelphia	75¢ @ 10¢
Ross	70¢ @ 10¢
Boss Anti-Friction	70¢ @ 10¢
Martin's Patent (Phonix)	70¢ @ 10¢
Payson's Anti-Friction Furniture	70¢ @ 10¢
Payson's Anti-Friction Truck	70¢ @ 10¢
Standard Ball Bearing	40¢
Tucker's Patent, low list	30¢

**Cattle Leaders—**See *Leaders, Cattle.***Chain—**

American Coil, Full Casks:	
5-16 1/4 5-16 3/4 7-16 1/4 9-16	
7-25 6-36 4-35 5-30 3-35 3-25 3-15	
1/4 3/4 1/2 to 1 1/2 inch.	
3-10 3-05 5-00 cents per lb.	
Less than Cash lots add 10¢ per 100 lbs.	
German Coil, list July 24, '97, 80¢ @ 10¢	
German Hailer Chain, list July 24, '97	
Traces, Western Standard: 100 pair	
6 1/2—6 3/4, Straight, with ring	\$25.00
6 1/2—6 3/4, Straight, with ring	\$27.00
6 1/2—6 3/4, Straight, with ring	\$31.00
6 1/2—10-2, Straight, with ring	\$35.00
Add 2¢ per pair for Hooks.	
Twist Traces 2¢ per pair higher than	
Straight Link.	

**Trace, Wagon and Fancy Chains.**

list April, '98	50¢ @ 10¢ @ 50¢
Jack Chain, list July 10, '93	
Iron	80¢ @ 60¢ @ 10¢
Brass	80¢ @ 80¢ @ 10¢
Safety Chain	60¢ @ 10¢ @ 70¢
Gal. Pump Chain	1/4 1/2 3/4 1/2
Covert Sad. Works:	
Breast, Hitching and Rein Chains	50¢
Covert Mfg. Co.:	
Breast	35¢ @ 25¢
Halter	35¢ @ 25¢
Heel	35¢ @ 25¢
Keln	35¢ @ 25¢
Stallion	35¢ @ 25¢

**Oneida Community:**

Eureka Coll and Halter	60¢ @ 40¢ @ 55¢
Nagara Coll and Halters	60¢ @ 40¢ @ 55¢
Nagara Cow Ties	45¢ @ 45¢ @ 10¢ @ 55¢
Am. Coll and Halters	50¢ @ 10¢ @ 80¢ @ 40¢
Am. Cow Ties	35¢ @ 40¢ @ 55¢
Wire Goods Co.:	
Dog Chain	60¢
Universal Jointed Chain	45¢

**Chalk—(From Jobbers.)**

Carpenters', Red	gro. 15¢
Carpenters', Blue	gro. 10¢
Carpenters', White	gro. 25¢
See also Crayons.	

**Chalk Lines—See Lines.****Checks, Door—**

Bardsley's	40¢ @ 10¢
Columbia	40¢ @ 10¢
Eclipse	60¢ @ 10¢ @ 10¢

**Chests, Tool—**

American Tool Chest Co.:	
Boys' Chests, with Tools	55¢
Youths' Chests, with Tools	40¢
Gentlemen's Chests, with Tools	30¢
Farmers', Carpenters', etc., Chests, with Tools	30¢
Machinists' and Pipe Fitters' Chests	30¢
Empty	30¢
C. E. Jennings & Co.'s Machinists' Tool Chests	25¢ @ 25¢ @ 10¢

**Chisels—**

Socket Framing and Firmer	
Standard List	70¢ @ 50¢ @ 10¢
Buck Bros.	30¢
Charles Buck	30¢
C. E. Jennings & Co. Socket Firmer	No. 10, 60¢ @ 10¢
C. E. Jennings & Co. Socket Framing	No. 15, 60¢ @ 10¢
Swan's	70¢ @ 50¢
L. & L. J. White	30¢ @ 30¢ @ 55¢

**Tanged—**

Tanged Firmers	10¢ @ 50¢ @ 10¢
Buck Bros.	30¢
Charles Buck	30¢
C. E. Jennings & Co. No. 101, 181	25¢
L. & L. J. White, Tanged	25¢ @ 55¢

**Cold—**

Cold Chisels, good quality lb. 1/4 @ 16¢	
Cold Chisels, fair quality	lb. 12¢
Cold Chisels, ordinary	lb. 8¢ @ 30¢

**Chucks—**

Beach Pat., each \$8.00	20¢
Skinner Patent Chucks:	
Combination Lathe Chucks	40¢
Drill Chucks, Patent and Standard	30¢
Drill Chucks, New Model	2 1/2
Independent Lathe Chucks	40¢
Improved Planer Chucks	20¢
Universal Lathe Chucks	40¢
Face Plate Jaws	35¢
Standard Tool Co.:	
Improved Drill Chuck	45¢
Union Mfg. Co.:	
Combination	40¢
Czar Drill	30¢
Geared Scroll	40¢
Independent	40¢
Union Drill	30¢
Universal	40¢
Face Plate Jaws	35¢

**Clamps—**

Adjustable, Hammers'	20¢ @ 20¢ @ 35¢
Adjustable, Stearns'	30¢
Cabinet, Sargent's	50¢ @ 10¢
Carriage Makers', P. S. & W. Co.	40¢ @ 10¢
Carriage Makers' Sargent's	50¢ @ 10¢
Best, Parallel	35¢ @ 10¢
L. & L. J. White, Ulica Drop Forge & Tool	40¢
Co	40¢
Saw Clamps, see <i>Face, Saw Files</i>	

**Cleaners Walk—**

Star Socket, All Steel	\$4.00 net
Star Shank, All Steel	\$3.75 net
W. & C. Shank, All Steel, 7 1/2 in. x 1/2 in.	\$3.35; 8 in., \$3.40; 8 1/2 in., \$3.50.

**Cleavers, Butchers—**

Foster Bros.	30¢
New Haven Edge Tool Co.'s	40¢ @ 10¢
Nichols Bros., Flat hdl., 30¢; Rd hdl., 40¢	
Fayette R. Plumb	35¢ @ 35¢ @ 10¢
P. S. & W.	35¢ @ 35¢ @ 10¢
L. & L. J. White	25¢

**Clippers—**

Chicago Flexible Shaft Company	
Handy Toilet	\$7.30
Mascotte Toilet	\$3.40
Monitor Toilet	\$9.00
Stewart's Patent	\$10.00

**Clips, Axe—**

Eagle and Superior 1/4 and 5-16 inch	70¢ @ 10¢
Norway, 1/4 and 5-16 inch	70¢ @ 10¢

**Cloth and Netting, Wire—**See *Wire, etc.***Cocks, Brass—**

Hardware list (Globe, Kerosene, Lever Bibbs, Racking, etc.)

**Coffee Mills—See Mills, Coffee.****Collars Dog—**

Brass, Pope & Stevens' list	40¢
Embossed, Gilt, Pope & Stevens' list	30¢ @ 10¢
Leather Pope & Stevens' list	40¢

**Compasses, Dividers, &c.**

Ordinary Goods	70¢ @ 10¢ @ 75¢
Benja & Call Hdw. & Tool Co.:	
Dividers	65¢
Calipers, Call's Patent Inside	55¢
Calipers, Double	65¢
Calipers, Inside or Outside	65¢
Calipers, Wing	60¢
Compasses	50¢
J. Stevens & A. T. Co.	25¢ @ 10¢

**Conductor Pipe, Galvanized—**

Territory	Carload	L. C. L.
Eastern	75¢ @ 10¢	75¢ @ 5¢
Central	75¢ @ 7 1/2¢	75¢ @ 2 1/2¢
Southern	75¢ @ 5¢	75¢
S. Western	75¢	70¢ @ 10¢ @ 2 1/2¢
Terms, 2 1/2% for cash.		
See also Eave Trough.		

**Coolers, Water—**

Nos.	2	3	4	6
Labrador	\$11.50	\$14.00	\$17.50	\$20.00
3 gal.				
Nos.	3	4	6	8
Iceland	\$23.00	\$25.00	\$30.00	\$37.50
10 14 gal.				
\$57.00	\$72.00			

**Coopers' Tools—**

See <i>Tools, Coopers'.</i>	
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**Cord—Sash—**

Braided, Drab	lb. 25¢
Braided, White, Common, lb 17 1/2¢ @ 18¢	
Cable Laid Italian, lb. A, 18¢; B, 16¢	
Common India	lb. 8¢ @ 9 1/2¢
Cotton Sash Cord, Twisted	lb. 12¢ @ 16¢
Patent Russia	lb. 12¢ @ 16¢
Cable Laid Russia	lb. 15¢ @ 16¢
India Hemp, Braided	lb. 14¢ @ 15¢
India Hemp	lb. 10¢ @ 12¢
Patent India	lb. 10¢ @ 12¢
Pearl Braided, cotton	lb. 16¢ @ 18¢
Massachusetts, White	lb. 22¢ @ 24¢
Massachusetts, Drab	lb. 26¢ @ 28¢
Eddystone Braided Cotton	lb. 14¢
Harmony Cable Laid Italian	lb. 15¢
Oswan Mills:	
Crown, Solid Braided White	lb. 18¢
Braided, Giant, White	lb. 17¢

**Peerless—**

Cable Laid Italian	10¢
Cable Laid Russian	14¢
Cable Laid India	12¢
Braided India	18¢
Phoenix, White	19¢
Braided, Drab Cotton	lb. 32¢ @ 34¢
Braided, Italian Hemp	lb. 32¢ @ 34¢
Braided, Linen	lb. 40¢
Braided, White Cotton, Spot	lb. 28¢ @ 30¢

**Silver Lake:**

A quality, Drab, 40¢	15¢
A quality, White, 35¢	15¢
B quality, Drab, 35¢	15¢
B quality, White, 30¢	15¢
Italian Hemp, 40¢	15¢
Linen, 57¢	15¢

**Wire, Picture—**

Braided or Twisted	
See <i>Trade Report.</i>	

**Corn Knives and Cutters**

See <i>Knives, Corn.</i>	
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**Corn Planters—**

See <i>Planters, Corn.</i>	
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**Crackers, Nut—**

Little Giant	\$34.00
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**Cradles—**

White Round Crayons, gross 5¢ @ 6¢	
Cases, 100 gro., \$5.00, at factory.	

**Crayons—**

D. M. Steward Mfg. Co.:	
Metal Workers' Crayons, gr. \$2.50	
Soapstone Pencils, round, flat or square	gr. \$1.50
Rolling Mill Crayons	gr. \$2.50
Railroad Crayons (compo. sition) gr. \$2.00	

**See also Chalk.****Creamery Pails—See Pails, Creamery.****Crooks, Shepherds—**

Fort Madison, Heavy	\$7.00
Fort Madison, Light	\$6.50

**Crow Bars—See Bars, Crow.****Cultivators—**

Victor Garden	\$10.00
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**Cutters—Glass—**

Smith & Heminway Co.	30¢
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**Meat—**

Hale's, Nos. 11 & 11 1/2 & 11 3/4 & 11 5/8	
Per doz	\$10.30 12 20 18.00
American	30¢
Nos.	1 2 3 4 5
Each	\$5 \$7 \$10 \$25 \$50 \$60
Connecticut	
No.	0 1 8 10 19
Each	\$1.75 2.25 3.00 3.00 3.50

**Enterprise**

Nos.	5	10	12	22	32
Each	\$2	\$3	\$2.50	\$4	\$6
Dixon's, # doz	1	2	3	4	5
Nos.	1	2	3	4	5
Home No. 1, # doz	\$22.50	\$30.00	\$40.00	\$50.00	\$60.00
Little Giant, # doz	\$35.00	\$45.00	\$55.00	\$65.00	\$75.00
Nos. 305 310 312 340 322					
\$35.00 \$45.00 \$44.00 \$74.00 \$88.00					
Sterling	33 1/2				
Each	\$2.00	\$2.50	\$2.50	\$2.50	\$2.50
Miles' Challenge, # doz	45	45	45	45	45
Nos.	1	2	3	4	5
New Triumph No. 605, # doz	\$24.00	\$30.00	\$40.00	\$50.00	\$60.00
Woodruff's, # doz	33 1/2				
Nos.	1	100	150		
Each	\$15.00	\$18.00	\$18.00		
Chadborn's Smoked Beef Cutter, # doz	\$60.00				
Enterprise Beef Shavers	25	30			

**Slaw and Kraut—**

Henry Diston & Sons:	
Slaw, Corn Grater, etc.	40¢
Kraut Cutters 24 x 7, 26 x 8, 30 x 9, 35 x 10	
Kraut Cutters 36 x 12, 40 x 12	40¢
Tucker & Dorsey Mfg. Co.:	
Kraut Cutters	40¢
Slaw Cutters, 1 Knife, # gr.	\$15 @ \$20
Slaw Cutters, 2 Knife, # gr.	\$22 @ \$36

**Tobacco—**

All Iron, Cheap	doz. \$4.25 @ \$1.50
Enterprise	25 @ 30¢
National, # doz	\$21.00
Sargent's, # doz	\$24.00

**Washer—**

Appleton's, # doz	\$18.00
Bonney's	50¢ @ 10¢ @ 10¢

**Diggers, Post Hole, &c.—**

Dalbey Post Hole Auger, per doz	\$10.00
Iwan's Improved Post Hole Auger	40¢
Iwan's Perfection Post Hole Digger	
Kohler's Universal	# doz, \$14.00
Kohler's Little Giant	# doz, \$15.00
Kohler's Hercules	# doz, \$12.00
Kohler's Invincible	# doz, \$10.00
Kohler's Rival	# doz, \$8.00
Kohler's Pioneer	# doz, \$9.00
Never-Break Post Hole Diggers, # doz	\$24.00
Samson, # doz	\$34.00

**Dividers—See Compasses.****Dog Collars—See Collars, Dog.****Door Checks—**See *Checks, Door.***Door Springs—**See *Springs, Door.***Drawers, Money—**

Tucker's Pat. Alarm Till No. 1, # doz.	\$18; No. 2, \$15; No. 3, \$14; No. 4, \$13.
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**Drawing Knives—**See *Knives, Drawing.***Drills and Drill Stocks—**

Common Blacksmiths' Drill, each	\$1.50 @ \$1.75
Blacksmiths' Self-feeding	each \$3.75 @ \$4.00
Bench Drills, Stearns'	60¢
Breast, Millers Falls, each \$3.00	15¢ @ 1





**Ladies—Melting—**

L. & G. Mfg. Co.	60%
P. S. & W.	40@40.10%
Reading	50@10%
Sargent's	40@40.10%

**Lanterns—Tubular—**

Regular Tubular	doz. \$1.50@5.00
Side Lift Tubular	doz. \$1.75@5.25
Square Lift Tubular	doz. \$1.75@5.25
Other Styles	40@10@10@10@5%

**Bull's Eye Police—**

No. 1, 3/4 inch	doz. \$3.60
No. 2, 5 inch	doz. \$4.00

**Latches, Thumb—**

Boggin's Latches	doz. \$2@35c
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**Lawn Mowers—**

See Mowers, Lawn.

**Leaders, Cattle—**

Small	doz. 45c; large, 55c
Covert Mfg. Co.	45@25%

**Lemon Squeezers—**

See Squeezers, Lemon.

**Lifters, Transom—**

Dickson	3 x 4 ft. x 1/2" doz. \$1.00 \$1.10
Other sizes, Iron	70@10%
Other sizes, Brass and Bronze	70%

Payson's	doz. \$1.00
Solid Grip Nos. 649 and 644	doz. \$1.00
Bronzed Iron	70%

**Lines—**

Wire Clothes, Nos.	18 19 20
100 feet	\$2.20 8.00 1.65
75 feet	\$1.80 1.70 1.50

**Cosman Mills—**

Crown Solid Braided Chalk	83@45
Mason's, No. 0 to No. 5	83@45
Solid Braided Chalk, No. 0 to 5	40%

**Silver Lake Braided Chalk, No. 0, 6, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100.**

No. 1, 6, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100.	80%
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**Looks—****Cabinet—**

Cabinet Locks	53@60@71@75
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**Door Locks, Latches, &c.—**

[Net prices are very often made on these goods.]

Reading Hardware Co.	40%
R. & E. Mfg. Co.	40%
Sargent & Co.	40@40.10%
Blaymaker-Harry Co.	30@35%
Snow's Victor	50@10%

**Elevator—**

Stowell's	83@45
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**Padlocks—**

Wrought Iron, list Dec. 2, '97	75@10%
Dog Collar, S. B. Co.	40%
R. & E. Mfg. Co. Wrt. Steel and Brass	40%
S. B. & Co.	40%

**Sash, &c.—**

Fitch's Brons and Brass	60@45
Fitch's Iron	70%
Ives' Patent	55@55%
Oeffinger's Automatic	70%
Payson's Patent	70%
Payson's Signal (new list)	70%
Reading	60@10@10@70%

**Machines—****Boring—**

Without Augers	
Upright	Angular

Improved No. 8	\$4.25 No. 1 \$5.00
Improved No. 4	3.75 No. 2 3.98
Improved No. 2	2.75 No. 3 2.98
Jennings	2.50 8.00
Miller's Falls	5.75
Snell's, Rice's Pat.	2.50
Swan's, No. 500	5.10 No. 800 2.45

**Holisting—**

Moore's Anti-Friction Differential Pulley Block	80%
Moore's Hand Hoist, with Lock Brake	80%

**Ice Cutting—**

Chandler's	15%
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**Washing—**

Wayne American	doz. \$28.00
Western Star, No. 2, 3	28.00
Western Star, No. 3, 4	30.00
St. Louis, No. 41, 42	60.00

**Mallets—**

Hickory	45@50@55%
Lignumvitae	45@50@55%
Tanners', Hickory and Applewood	60@55%
Other Head Stearns	80@10%

**Mats—**

Elastic Steel (W. G. Co.)	10%
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**Mattocks—**

See Picks and Mattocks.

**Meat Cutters—**

See Cutters, Meat.

**Milk Cans—See Cans, Milk****Mills—Coffee—**

Box and Side, list Jan. 1, '98	50@10@50@80%
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Net prices are often made on some goods which are lower than above discounts.

Enterprise Mfg. Co.	25@30%
National, list Jan. 1, '94	30%
Parker's Columbia and Victor	80%
Parker's Box and Side	80@10@80%
Witt, Lane Bros.	80@10@80%

**Mining Knives—**

See Knives, Mining.

**Molasses Cates—**

See Gates, Molasses.

**Money Drawers—**

See Drawers, Money.

**Mowers, Lawn—**

Net prices are generally quoted.

Cheap	all sizes, \$2.00@2.10
Good	all sizes, \$2.50@2.75

**High Grade 4.25 4.50 4.75 5.00**

Pennsylvania and Continental	60@10%
Quaker City	70@5%
Great American	70@5%

**Philadelphia—**

Styles M. S., C. K., T.	70@5%
Style A, all Steel	60@10%
Style F, Low Wheel	60@10%
Style E, High Wheel	70@10%
Drexel and Gold Coin, low list	50@5%

**Nails—**

Cut and Wire. See Trade Report.

Wire Nails and Brads, Papered.

List July 20, 1899. 85@85@10%

**Hungarian, Finishing, Upholsters, &c. See Tacks****Horse—**

No. 6 7 8 9 10	
A. C.	25@25@25@25@25%

Capewell	19@18@17@16@15@14@13@12@11@10@9@8@7@6@5@4@3@2@1@0
C. B. K.	25@25@25@25@25%
Champlain	25@25@25@25@25%

Maud S.	25@25@25@25@25%
Neponset	25@25@25@25@25%
Putnam	25@25@25@25@25%
Standard	25@25@25@25@25%
Star	25@25@25@25@25%
Vulcan	25@25@25@25@25%

**Picture**

Brass Head	1 1/2 2 3/4 3 3 1/2 in.
Por. Head	1.10 1.10 1.10 gro.

**Nippers, See Pliers and Nippers.****Nut Crackers—**

See Crackers, Nut.

**Nuts—**

List Feb. 1, '99.

**Cold Punched**

Mfrs. or U. S. Standard. list.

Hexagon, plain	5.50@5.00
Square, plain	5.50@5.00
Square, C. T. & R.	5.70@5.80
Hexagon, C. T. & R.	5.50@5.80

**Hot Pressed:**

Mfrs., U. S. or Nar. Gauge Stan'd.

Square Blank or Tapped, 5.90@6.00

Hexagon Blank or Tapped, 6.80@7.00

**Oakum—**

Best or Government	lb. 64c
Navy	lb. 6 c
U. S. Navy	lb. 64c
Plumbers' Spun Navy	lb. 64c
In carload lots 1/4 lb. off f.o.b. New York	

**Oil, Axle—**

Snow Flake	
1 pt. cans, per doz.	\$3.00
1 qt. cans, per doz.	\$4.80
1 gal. cans, per doz.	\$15.00
5 gal. cans, per doz.	\$68.00

**Oil Tanks—See Tanks, Oil.****Oilers—**

Brass and Copper	40@10@50%
Tin or Steel	60@10@65%
Zinc	60@10@65%

**Malleable, Hammers' Improved, No. 1.**

\$3.80; No. 2, \$4; No. 3, \$4.40 per doz. 20%

**Malleable, Hammers' Old Pattern.**

same list. 60@10%

**Wilmot & Hobbs Mfg. Co.**

Spring Bottom Cans. 70@10%

Railroad Oilers etc. 80@10%

**Openers—****Can—**

French	doz. 25c
Iron Handle	doz. \$5@7c
Sprague, Iron Handle	per doz. \$5@10c
Sardine Soissors	doz. \$1.75@2.00
Tip Top	per doz. \$0.75
National	per doz. \$1.75@2.00
Stowell's	per doz. 40@45c
Waldorf	per doz. \$0.90

**Egg—**

Nickel Plate	per doz. \$2.00
Silver Plate	per doz. \$4.00

**Packing—****Rubber—**

Standard, fair quality	70@10@75%
Inferior quality	75@10@80%
Extra	80@10@85%
Jenkins' Standard	80@10@85%

**Miscellaneous—**

American Packing	9@10c lb.
Cotton Packing	13@14c lb.
Italian Packing	10@11c lb.
Jute	6@5c lb.
Russia Packing	13@13c lb.

**Pails—****Creamery—**

S. S. & Co., with gauges. No. 1	\$0.50;
No. 2, 6.75	per doz.

**Galvanized—**

Price per gro.

Inch	10 12 14
Water, Regular	18.00 21.00 24.00
Water, Heavy	22.00 25.00 28.00
Fire, Ed. Bottom	21.00 25.00 28.00
Well	27.00 29.00 31.00

**Pans—****Dripping—**

Standard List	65@10@65%
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**Fry—****Common Lipped:**

No.	1 2 3 4 5
Per doz.	\$0.50 .75 .85 .95 1.15

**Roasting and Baking—**

Royal S. S. & Co., 7 doz. Nos. 5	\$4.50;
10 \$5.00; 20 \$5.50; 30 \$6.00;	
Simplex, 7 doz. No. 40	\$30.00; 50,
\$34.50; 60 \$39.00; 140, \$33.00; 150,	
\$37.50; 160, \$43.00.	

**Paper—****Building Paper—**

Rosin Sized Sheathing	Per roll
Light wt., 20 sq. ft. to lb.	\$0.40@0.45
Medium wt., 15 sq. ft. to lb.	\$0.80@0.85

**Heavy wt., extra quality \$0.95@1.05****Medium Grades Water Proof****Sheathing \$0.80@1.25****Deafening Felt, 2, 6 and 1 1/2 sq. ft.**

to lb., ton. \$4.00

**York Haven Waterproof Sheathing.**

	\$1.85@1.75
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**Tarred Paper.**

1 ply (roll 300 sq. ft.), ton	\$23.00
2 ply, roll 100 sq. ft.	55c
3 ply, roll 100 sq. ft.	80c

**Sand and Emery—**

List Dec. 23, 1899. 50@10@50@10@10%

**Parers—****Apple—**

Advance	doz. \$4.50
Baldwin	doz. \$5.00
Donatus	each \$5.00
Dandy	each \$7.50
Eureka	each \$10.00
Family Bay State	doz. \$12.00
Hudson's Little Star	doz. \$4.00
Hudson's Rocking Table	doz. \$5.50
Improved Bay State	doz. \$27.00@30.00
New Lightning	doz. \$5.50
Reading 72	doz. \$4.00
Reading 78	doz. \$7.00
Turn Table '98	doz. \$5.50
White Mountain	doz. \$4.00

**Potato—**

Saratoga	doz. \$5.50
White Mountain	doz. \$4.50

**Picks and Mattocks—**

List Feb. 23, 1899. 75@75@10%

**Pinking Irons—**

See Irons, Pinking.

**Pins—****Escutcheon—**

Brass	60@10%
Iron, list Nov. 11, '98	60@10%

**Pipe, Cast Iron Soil—**

Factory Shipments.

Standard, 2-6 in.	70@70@5%
Extra Heavy, 2-6 in.	75%
Fittings	75@10@30%

**Pipe, Merchant, Boiler****Tubes, &c.—**

Carloads to Consumers.

**Merchant Pipe.**

Black	Galva-
1/4 to 1/2 inch	nized.
1/2 to 10 inch	61% 45% 55%

**Boiler Tubes**

Brass .....	60¢
Iron, list Nov. 11, '85.....	60¢





**Shovels and Tongs—**

Brass Head.....60¢@60¢10¢  
Iron Head.....60¢@60¢10¢

**Sieves and Sifters—**

Hunter's Imitation, gro. \$11.00@12.00  
Buffalo Metallic Blue, S. S. & Co., gr. 7.  
14 in. 16 in. 18 in. 20 in.  
\$12.90 \$13.80 \$15.00 \$16.00  
Eclipse.....gr. \$10.00  
Electric Light.....gr. \$12.50  
Hunter's Genuine.....gr. \$12.50  
Shaker (Barber's Pat.) Flour Sifters.  
gr. doz. \$2.00.....30¢

**Sieves, Tin Rim—**

Inch.....14 16 18 20  
Black, full size.....\$0.95 .98 1.03 1.10  
Plated, full size.....\$1.05 1.03 1.10 1.20  
Black, scant.....\$0.78 .80 .83

**Sieves, Wooden Rim—**

Nested, 10, 11 and 12 Inch.  
Mesh 18, Nested, doz.....\$1.75@0.80  
Mesh 20, Nested, doz.....35¢@.90  
Mesh 24, Nested, doz.....1.00@1.05

**Sinks—**

Cast Iron.....60¢@60¢10¢  
Note.—There is not entire uniformity  
in lists used by jobbers.

**Wrought Steel—**

Columbus Galv'd and Enamelled.....60¢5¢  
Columbus, Painted.....45¢  
L. & G. Mfg. Co., Galv'd and Enamelled.....50¢  
L. & G. Mfg. Co., Enamelled.....50¢

**Skins, Wagon—**

Cast Iron.....70¢10¢@75¢  
Malleable Iron.....10¢10¢@50¢  
Steel.....40¢10¢@105¢

**Slates—**

"D" Slates.....60¢10¢@50¢10¢10¢  
Unexcelled Noiseless Slates.....  
60¢5¢10¢@40¢5¢10¢5¢  
Wire Bound.....40¢10¢@50¢  
Double Slates, add \$1 case, net.

**Slaw Cutters—See Cutters.****Slicers, Vegetable—**

Sterling \$2.00.....33¢4¢

**Snaps, Harness—**

German.....40¢10¢@10¢

**Covert Mfg. Co.:—**

Derby.....35¢2¢  
High Grade.....45¢2¢  
Jockey.....45¢2¢  
Trojan.....45¢2¢  
Yankee.....45¢2¢  
Yankee, Roll Off.....30¢2¢

**Covert's Saddlery Works:—**

Banner.....60¢10¢  
Crown.....60¢10¢  
Triumph.....60¢10¢

**W. & E. T. Fitch Co.:—**

Bristol.....40¢10¢  
Empire.....50¢5¢  
German.....40¢  
National.....50¢5¢  
Perfect.....45¢  
Clipper.....50¢5¢  
Champion.....40¢  
Security.....40¢  
Victor.....60¢5¢

**Oneda Community:—**

Solid Steel.....65¢65¢@5¢10¢10¢  
Solid Wire.....65¢10¢@5¢10¢10¢  
Sargent's Patent Guarded.....60¢5¢10¢

**Snaths—**

Scythe.....45¢5¢

**Snips, Tinnners'—See Shears.****Soldering Irons—**

See Irons, Soldering.

**Spoke Trimmers—**

See Trimmers, Spoke.

**Spoons and Forks—****Silver Plated—**

Flat Ware.....50¢10¢@60¢10¢

Wm. Rogers Mfg. Co.....50¢10¢

**Miscellaneous—**

German Silver.....60¢10¢

Wm. Rogers Mfg. Co.:—

185 German Silver.....60¢

Rogers' Silver Metal.....50¢10¢

**Springs—****Door—**

Gem (Coil).....30¢  
Star (Coil).....30¢  
Torrey's Rod, 99 in. gr. doz. \$1.10@1.25  
Victor (Coil).....50¢10¢10¢

**Carriage, Wagon, &c.**

Factory Shipments.

1 1/4 in and wider.....Blk. Hf. Brt. Brt.

Cliff's Bolster Springs.....35¢

Cliff's Seat Springs.....pair 35¢

**Sprinklers, Lawn—**

Enterprise.....25¢30¢

Philadelphia No. 1, gr. doz. \$12; No. 2,  
\$18; No. 3, \$24.....30¢

**Squares—**

Nickel plated.....(List Jan. 5, 1901)

Steel and Iron.....75¢

Rosewood Hdl. Try Square and T-  
Bevels.....60¢10¢10¢@70¢

Iron Hdl. Try Squares and T-Bevels.  
40¢10¢@50¢10¢10¢

Diston's Try Sq. and T-Bev.....60¢10¢

Winterbottom's Try and Miter.....50¢10¢

**Squeezers—****Lemon—**

Wood, Common, gro. No. 2, \$5.25  
\$5.60; No. 1, \$6.25@8.50.

Wood, Porcelain lined:  
Cheap.....doz. \$2.00@2.75

Good Grade.....doz. \$5.00@5.50  
Tinned Iron.....doz. \$0.75@1.25  
Iron, Porcelain Lined doz. \$2.90@3.25  
Jennings' Star.....gr. doz. \$1.85@1.90  
King.....gr. doz. \$2.00

**Staples—**

Barbed Blind.....lb. \$4@3¢  
Electricians', Association list.....7¢10¢  
Fence Staples, same price as Barbed  
Wire. See Trade Report.  
Poultry Netting, Staples.....per lb.  
Grand Crossing Tack Co.'s list.....8¢10¢

**Steels, Butchers'—**

Dick's.....40¢  
Foster Bros.....40¢  
C. & A. Hoffmann's.....40¢  
Nichols Bros.....50¢

**Steelyards.....25¢@5¢10¢****Stocks and Dies—**

Blacksmiths'.....40¢@50¢10¢  
Gardner Die Stocks No. 1.....50¢  
Gardner Die Stocks, larger sizes.....40¢  
Green River.....25¢  
Lightning Screw Plate.....25¢  
Little Giant.....25¢  
Reece's New Screw Plates.....25¢30¢  
Curtis Reversible Ratchet Die Stock.....25¢

**Stone—****Scythe Stones—**

Chicago Wheel & Mfg. Co.:  
Gem Corundum, 10 Inch, \$10.50 per  
gro., 12 Inch, \$12.00  
Cleveland Stone Co., list Nov. '92.....33¢4¢  
Pike Mfg. Co., list '95-'96.....33¢4¢

**Oil Stones, &c.**

Chicago Wheel & Mfg. Co.:  
Corundum Oil, Double Grit.....50¢  
Corundum Axe Stones, Slits, etc.....35¢  
Pike Mfg. Co.:  
Hindustan No. 1, gr. doz. \$8  
Sand Stone.....5¢  
Turkey Oil Stone, Extra.....33¢4¢10¢  
5 to 8 in. \$1.50  
Turkey White Washita.....60¢  
Lily White Washita.....60¢  
Rory Red Washita.....60¢  
Washita Stone, Extra.....50¢  
Washita Stone, No. 1.....40¢  
Washita Stone, No. 2.....30¢  
Lily White Slips.....90¢  
Rory Red Slips.....90¢  
Washita Slips, Extra.....70¢  
Washita Slips, No. 1.....70¢  
Arkansas Stone, No. 1, 3 to 5 in. \$2.50  
Arkansas Stone, No. 1, 5 to 8 in. \$3.50  
India Oil Stones.....25¢  
Tanite Mills:  
Emery Oil, gr. doz. \$5.00.....50¢60¢

**Stoners—****Cherry—**

Enterprise.....25¢30¢

**Stops, Bench—**

Millers Falls.....15¢10¢  
Morrill's.....gr. doz. No. 1, \$10.00; No. 2,  
\$11.00, 40¢20¢

**Stops, Window—**

Ives' Patent.....25¢5¢  
Wilcox, Steel, per doz. \$8.00.....50¢

**Stove Boards—**

See Boards, Stove.

**Stove Polish—See Polish, Stove.****Strainers, Pump—**

Diamond Joe Pump Strainers, per doz. 75¢

**Straps, Box—**

Cary's Universal case lots.....20¢10¢

**Stretchers, Carpet—**

Cast Iron, Steel Points.....doz. 55¢65¢  
Socket.....doz. \$1.75

**Stuffers, Sausage—**

Miles' Challenge, gr. doz. \$30.....50¢50¢5¢  
Enterprise Mfg. Co.....25¢2¢7¢5¢  
National Specialty Mfg. Co., list Jan.  
1, '97.....30¢

**Tacks Brads, &c.—**

List Jan. 15, '99.

Carpet Tacks, American.....20¢10¢@.5¢  
American Cut Tacks.....20¢30¢@.5¢  
Swedes Iron Tacks.....20¢10¢@.5¢  
Swedes Upholsterers' Tacks.....20¢10¢@.5¢

Gimp Tacks.....20¢10¢@.5¢  
Lace Tacks.....20¢10¢@.5¢  
Trimmers' Tacks.....20¢30¢@.5¢  
Looking Glass Tacks.....70¢10¢@.5¢  
Bill Posters' and Railroad Tack.....20¢10¢@.5¢

Hungarian Nails.....80¢25¢@.5¢  
Common and Patent Brads, 70¢10¢@.5¢  
Trunk and Clout Nails.....80¢10¢@.5¢

NOTE.—The above prices are for  
straight weights. An extra 5¢ is given  
Star Weights and an extra 10¢ 1/2 on  
Standard Weights.

**Miscellaneous—**

Double Point Tacks.....90¢5¢7¢10¢  
Steel Wire Brads, R. & E. Mfg.  
Co.'s list.....50¢10¢@60¢

See also Nails, Wire.

**Tanks, Oil—**

Emerald, S. S. & Co.....30-gal. \$3.20  
Emerald, S. S. & Co.....60-gal. \$4.00  
Queen City S. S. & Co., 60-gal.....\$3.50  
Queen City S. S. & Co., 60-gal.....\$4.25

**Tapes, Measuring—**

American Ases' Skin.....40¢10¢@50¢  
Patent Leather.....25¢30¢5¢  
Steel.....10¢10¢@5¢

Chesterman's.....25¢@5¢5¢  
Eddy's Steel.....40¢40¢5¢  
Eddy's Metallic.....33¢@33¢4¢5¢  
Keuffel & Esser Co., Steel and Metallic.  
Lower list, 1899.....35¢  
Lufkin's Steel.....33¢4¢35¢  
Lufkin's Metallic.....30¢30¢35¢

**Thermometers—**

Tin Case.....80¢90¢10¢

**Ties, Bale—Steel.**

Standard Wire.....60¢10¢5¢

**Ties, Wall—**

Cleveland Wire Spring Co.:  
Galv. st. el 5 3/2 x 6 1/2 in. gr. 1000 \$10.00  
Galv. Steel 5 3/2 x 8 1/2 in. gr. 1000 \$11.00  
Galv. Steel 5 3/2 x 1 1/4 in. gr. 1000 \$12.00  
Galv. Steel 5 3/2 x 1 1/2 in. gr. 1000 \$14.00

**Tinner's Shears, &c.—**

See Shears, Tinner's, &c.

**Tinware—**

Stamped, Japanned and Placed, sold  
very generally at net prices.

**Tire Benders, Upsetters,**

&c.—See Benders and Upset-  
ters, Tire.

**Tobacco Cutters—**

See Cutters, Tobacco.

**Tools—**

Coopers'.....20¢20¢5¢

**Saw—**

Atkins' new list.....40¢  
Simonds' Improved.....33¢4¢  
Simonds' Crescent.....25¢

**Ship—**

L. & I. J. White.....25¢

**Transom Lifters—**

See Lifters, Transom.

**Traps—Game—**

Oneida Pattern.....70¢10¢@75¢10¢  
Newhouse.....45¢5¢10¢  
Hawley & Norton.....65¢5¢70¢  
Victor (Oneida Pattern).....75¢75¢10¢  
Star (Blake Pattern).....65¢10¢@70¢5¢

**Mouse and Rat—**

Mouse, Wood, Choker, doz. holes.....8¢  
Mouse, Round or Square Wire.....  
doz. \$0.85@1.00  
Diamond Joe Mouse Traps.....per doz. 60¢  
Diamond Joe Rat Traps.....per doz. 1.00  
Marty French Rat and Mouse Traps  
(Genuine):  
No. 1, Rat, Each \$1.12 1/2, gr. doz. \$12.00  
No. 2, Rat, gr. doz. \$6.00; case of 50  
\$6.25 doz.  
No. 3 1/2, Rat, gr. doz. \$1.75; case of 72  
\$4.25 doz.  
No. 4, Mouse, gr. doz. \$3.50; case of 72  
\$2.75 doz.  
No. 5, Mouse, gr. doz. \$2.75; case of 72  
\$2.25  
Schuyler's Rat Killer, No. 1, gr. \$30.00;  
No. 2, gr. \$10.00; Mouse, No. 3,  
\$15.00.....50¢

**Fly—**

Balloon, Globe or Acme.....  
doz. \$1.15@1.25; gro. \$12.00@14.00  
Harper, Champion or Paragon  
doz. \$1.25@1.40; gro. \$13.50@15.00

**Trimmers, Spoke—**

Bonney's Nos. 1 and 2.....40¢  
Stearns.....25¢

**Trowels—**

Diston Brick and Pointing.....30¢  
Diston Plastering.....25¢  
Diston "Standard Brand" and Ga-  
den Trowels.....40¢  
Never-Break Steel Garden Trowel.....  
gro. \$7.00

Peace's Plastering.....30¢  
Rose Brick and Plastering.....25¢5¢  
Woodrough & McFarlin, Plastering.....25¢10¢

**Trucks, Warehouse, &c.—**

B. & L. Block Co.'s list.....40¢  
Daisy Stove Trucks, improved pattern  
gr. doz. \$21.00  
Model Stove Trucks.....gr. doz. \$18.50

**Tubs, Wash—**

Galvanized, per doz. \$5.00 5.50 6.00  
Galvanized Wash tubs (S. S. & Co.):  
No. 1 2 3 10 20 30  
Per doz \$5.25 6.00 6.75 6.50 7.25 8.00

**Twine—****Miscellaneous—**

Flax Twine— BC E.  
No. 9, 1/4 and 1/2-lb. Balls.....22¢ 26¢  
No. 12, 1/4 and 1/2-lb. Balls.....18¢ 21¢  
No. 18, 1/4 and 1/2-lb. Balls.....16¢ 19¢  
No. 24, 1/4 and 1/2-lb. Balls.....15¢ 18¢  
No. 36, 1/4 and 1/2-lb. Balls.....15¢ 18¢  
Chalk Line, Cotton, 1/2-lb. Balls.....  
22¢22¢4¢

Cotton Mops, 6, 9, 12 and 15 lb., to  
doz.....7¢8¢  
Cotton Wrapping, 5 Balls to lb.....  
10¢4¢

American 3-Ply Hemp, 1/4 and 1/2-lb.  
Balls.....12¢13¢  
American 3-Ply Hemp, 1-lb. Balls.....  
12¢13¢

India 3-Ply Hemp, 1/4 and 1/2-lb.  
Balls (Spring Twine).....10¢  
India 3-Ply Hemp, 1-lb. Balls.....10¢

India 3-Ply Hemp, 1/4-lb. Balls.....9¢  
2, 3, 4 and 5-Ply Jute, 1/2-lb. Balls.....  
10¢10¢  
Mason Line, Linen, 1/4-lb. Balls.....45¢  
No. 26 Mattress, 1/4 and 1/2-lb. Balls.....55¢  
Wool.....7¢

**Vises—**

Solid Box.....60¢  
Bonney's Saw Vises.....40¢10¢

**Parallel—**

Athol Machine Co.:  
Simpson's Adjustable.....40¢  
Standard.....40¢  
Amateur.....25¢  
Bonney's.....40¢10¢  
Fisher & Norris Double Screw.....15¢10¢  
Hollands:  
Machinists'.....40¢  
Keystone.....70¢  
Lewis Tool Co.....20¢30¢  
Massey's Perfect.....15¢20¢  
Massey's Clincher.....30¢40¢  
Merrill's.....20¢  
Miller's Falls.....low list 10¢  
Parker's:  
Victor.....20¢25¢  
Regular.....20¢25¢  
Vulcan.....40¢45¢  
Combination Pipe.....55¢60¢  
Prentiss.....20¢25¢  
Sargent's.....40¢  
Simpson's Adjustable.....40¢  
Snediker's X. L.....20¢25¢  
Stephens.....20¢32¢  
Toler's Woodworking.....25¢  
Van, W. & W. Hdw. Co.....40¢

**Saw Filers—**

Bonney's, No. 1, \$13; No. 3, \$16.50@10¢  
Dixon's D 3 Clamp and Guide, gr. doz.  
\$30.....25¢  
Reading.....40¢10¢  
Wentworth's Rubber Jaw, Nos. 1, 2  
and 3.....30¢10¢

**Miscellaneous—**

Signal & Keeler Combination Pipe  
Vise.....60¢

**Parker's Combination Pipe:**

#7 Series.....60¢  
#87 Series.....60¢5¢  
No. 870.....40¢

**Wads—Price Per M.**

B. E., 11 up.....60¢  
B. E., 9 and 10.....70¢  
B. E., 8.....80¢  
B. E., 7.....80¢  
P. E., 11 up.....\$1.00  
P. E., 9 and 10.....1.25  
P. E., 8.....1.50  
P. E., 7.....1.50  
Ely's B. E., 11 and larger.....\$1.70@1.75  
Ely's P. E., 12 to 20.....\$3.00@3.25

**Wagon Jacks—**

See Jacks, Wagon.

**Ware, Hollow—**

Aluminum—

S. S. & Co. Reduced List.....40¢

**Cast Iron, Hollow—**

Stove Hollow Ware:  
Ground.....60¢5¢@65¢  
Unground.....65¢10¢@70¢  
White Enamelled Ware:  
Mastin Kettles.....75¢10¢@80¢  
Boilers and Saucepans.....50¢5¢@50¢10¢  
Tinned Boilers and Saucepans.....  
60¢5¢@50¢10¢

See also Pots, Glue.

**Enamelled—**

Agate Nickel Steel Ware, list July '99, 35¢  
Granite Ware, list Jan. 1, '94, revised  
Jan. 2, '95.....40¢10¢  
Second Quality, Agate Nickel Steel.....65¢  
Second Quality, Granite.....70¢10¢@70¢10¢10¢

Iron Clad:  
Peppered Ware, high list.....70¢  
Mottled Ware, high list.....75¢  
Never Break Enamelled.....50¢5¢@50¢10¢

**Tea Kettles—**

Galvanized Tea Kettles:  
Inch.....6 7 8 9  
Each.....45¢ 50¢ 55¢ 65¢

**Steel Hollow Ware.**











## CARY'S BOX STRAPPING.

MADE IN VARIOUS WIDTHS.

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## OLD METALS AND OLD RUBBER

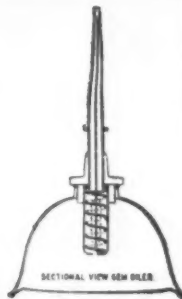
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but are  
the best oilers  
made.



GEM MANUFACTURING CO.,

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**PRIEST'S CLIPPERS**  
BALL BEARINGS  
Largest Variety,  
Toilet, Hand, Electric Power  
**ARE THE BEST.**  
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Sheep-Shearing Machines.  
**WE MAKE THEM.**  
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A Manual Compiled from Articles in  
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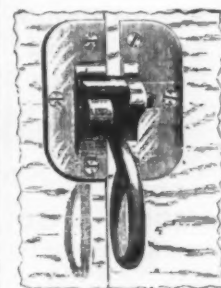
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PAPERS**

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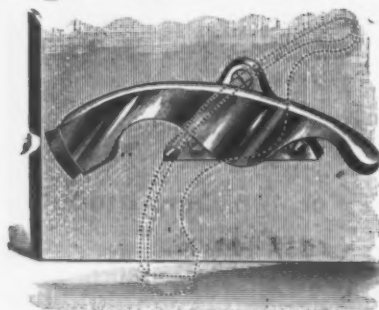
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Emery Cloth**

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730 MARKET STREET, PHILADELPHIA.  
67 BECKMAN STREET, NEW YORK.  
143 MILK STREET, BOSTON.  
162 LAKE STREET, CHICAGO.

## Empire Door Holder.



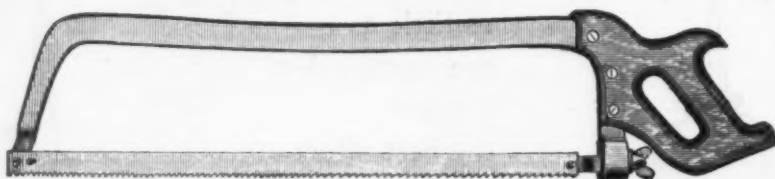
Operated by a light pressure of the toe. No bending over. The Rubber Tip and Spring Action make it particularly desirable for use on carpet, polished wood or tiled floor.

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## ★ STAR BUTCHER SAW. ★



## Don't Waste Your Time or Money

In having Butcher Saw Blades refiled when you can buy a new Star Blade for less than the cost of one filing. Star Blades are not intended to be refiled; they are made hard enough to do three or four times as much work before becoming dull as the ordinary blade is capable of doing under same conditions.

Supposing you have paid for forty filings in doing the amount of work that one dozen Star Blades will accomplish, then how much are you out? Consider also the convenience of always having sharp saws at hand.

Star Frames will please you both in quality and style. To try these goods once means to continue using them. They are now kept in stock by most of the prominent dealers throughout the country. Ask for them.

### PRICE OF BLADES.

\$1.08	\$1.08	\$1.20	\$1.20	\$1.32	\$1.32	\$1.44 per dozen
14	16	18	20	22	24	26 inch

### PRICE OF FRAMES (Without Blades).

90c.	\$1.00	\$1.10	\$1.20	\$1.30	\$1.40	\$1.50 each
14	16	18	20	22	24	26 inch

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28 Warren Street,

New York City.

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S. G. MONCE, UNIONVILLE, CONN.



# DISSTON'S SKEWBACK HAND SAWS.



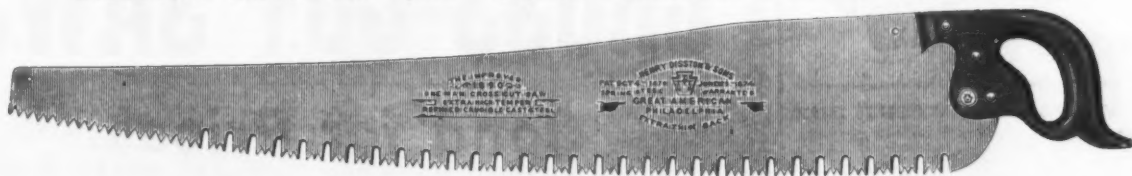
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BY THE LATE  
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DISSTON'S IMPROVED "1890" GREAT AMERICAN ONE MAN SKEWBACK.



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Either in Material, Workmanship or Finish.

## HENRY DISSTON & SONS

Keystone Saw, Tool, Steel and File Works,  
PHILADELPHIA, PENNA.

## OUR SILVER STEEL DAMASKEENED RIP SAW

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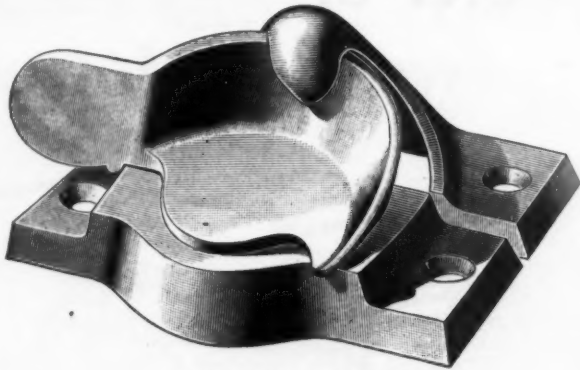
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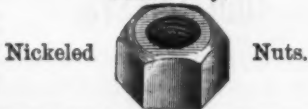
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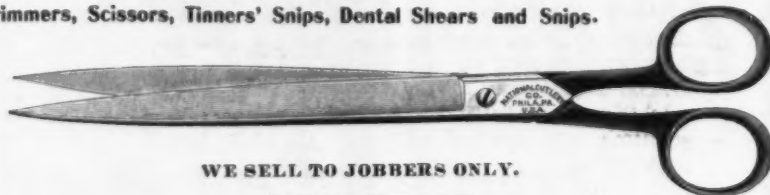
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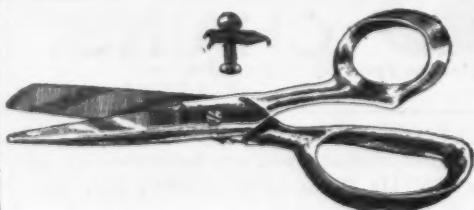
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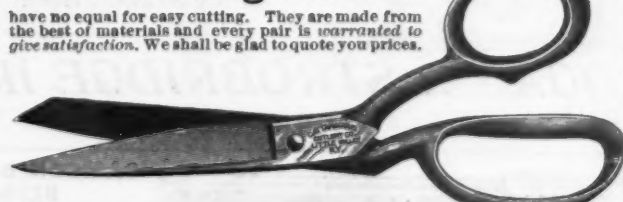
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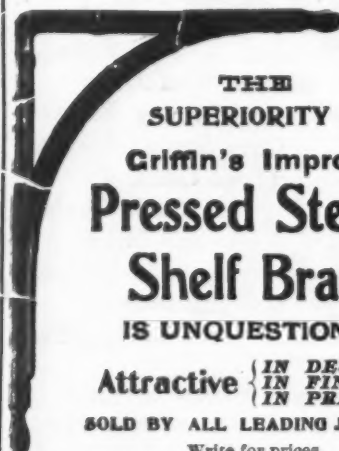
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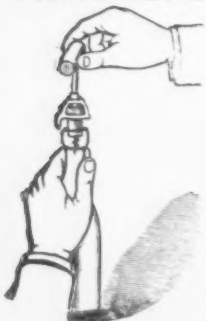
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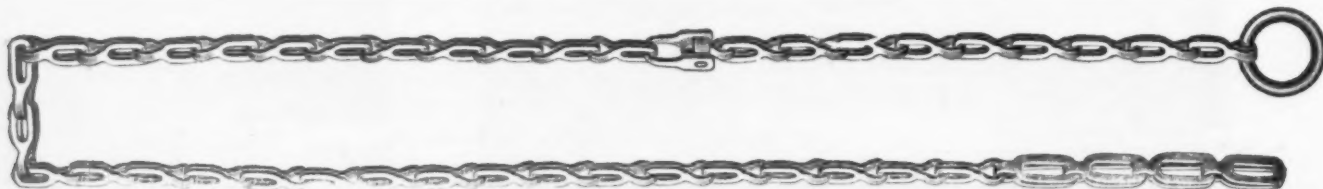


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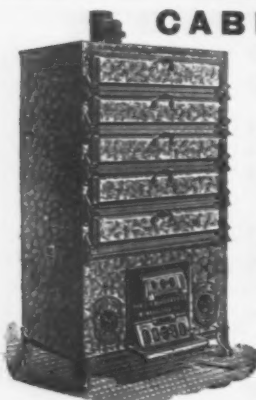
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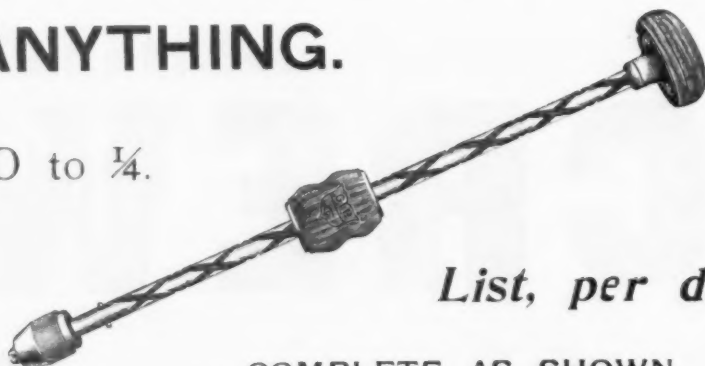
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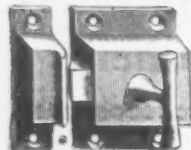
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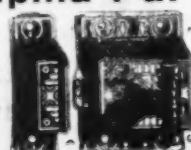
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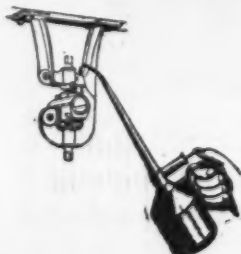
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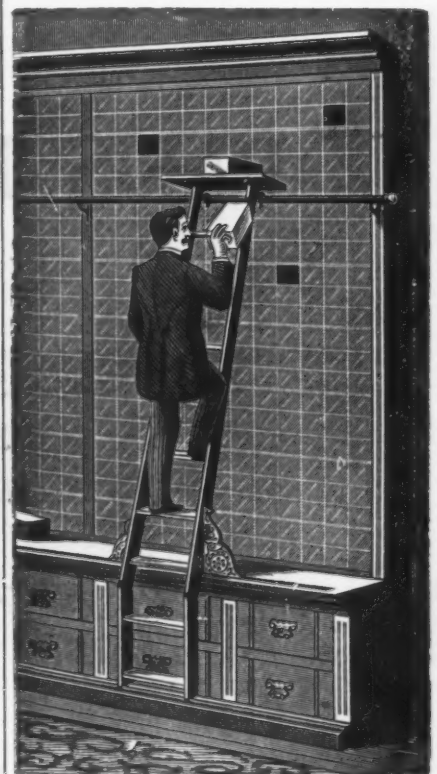
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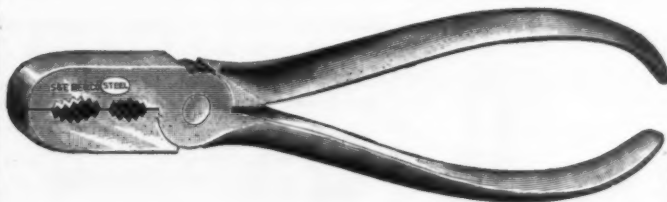
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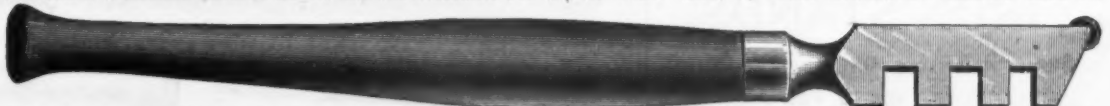
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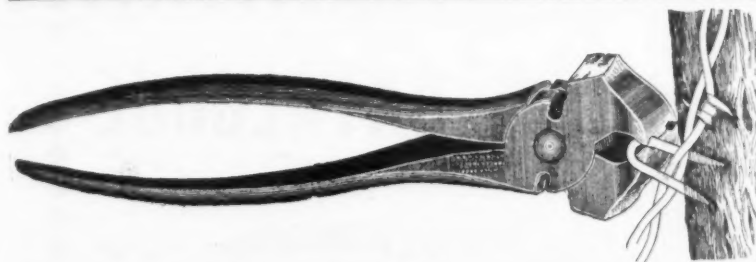


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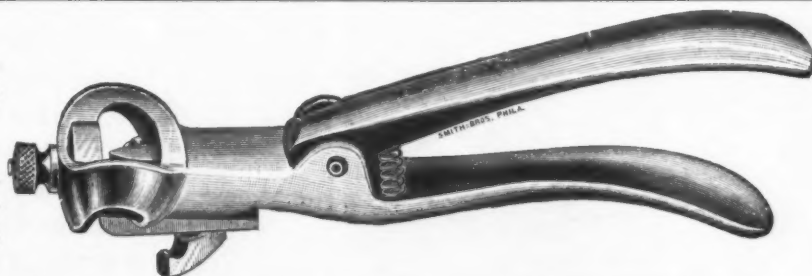
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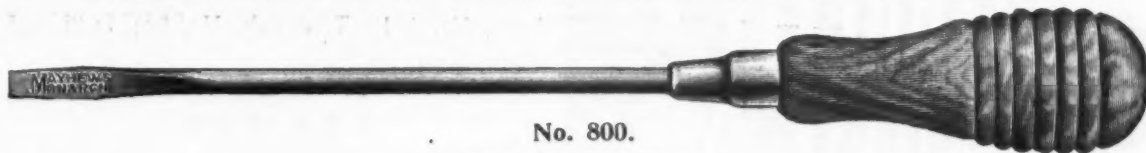
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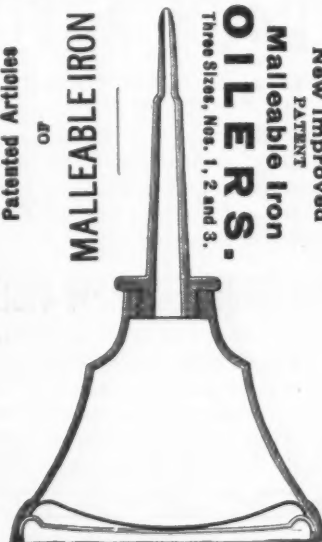
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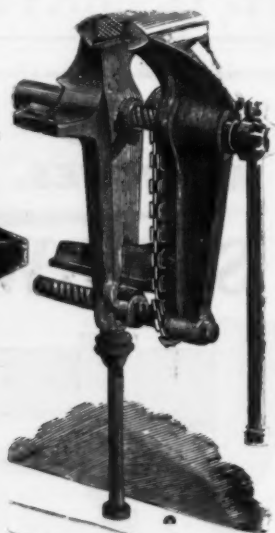
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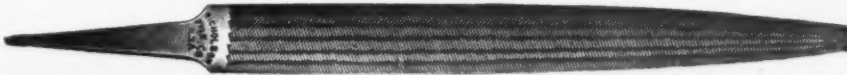
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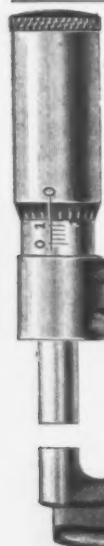
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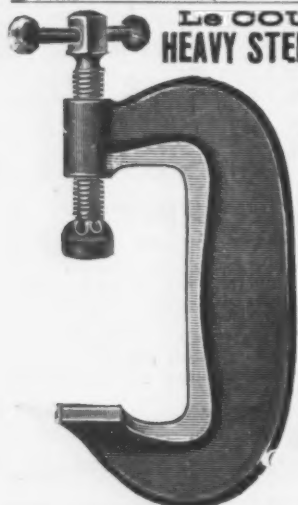
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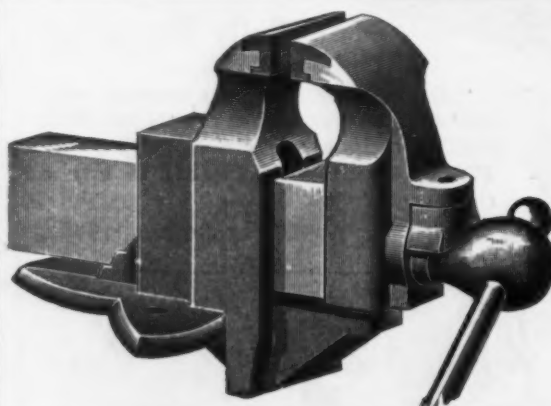


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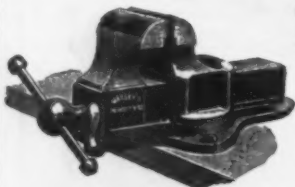


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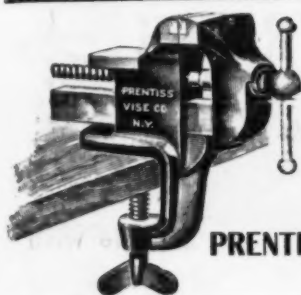


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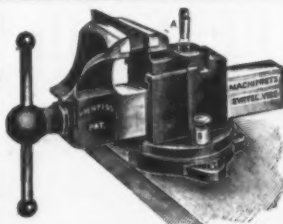
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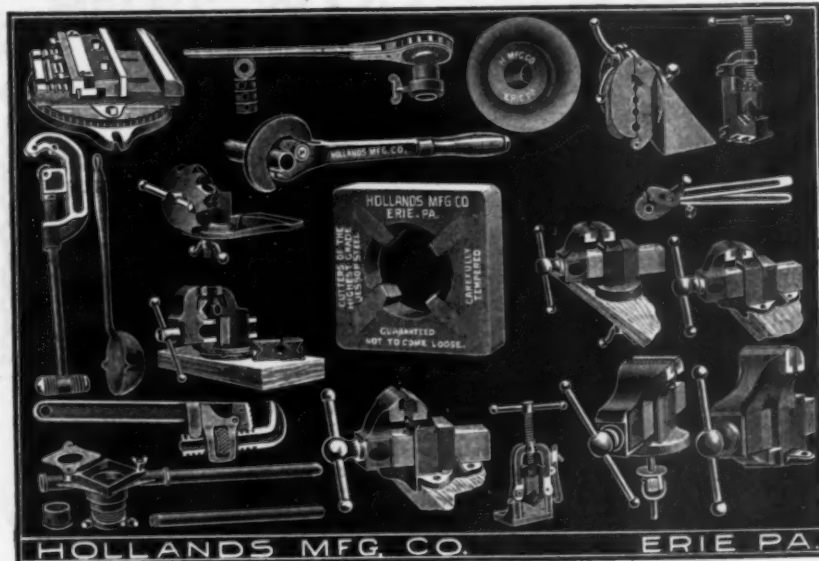
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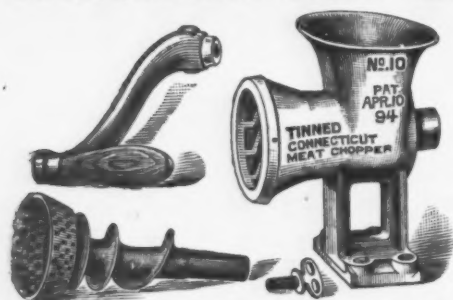
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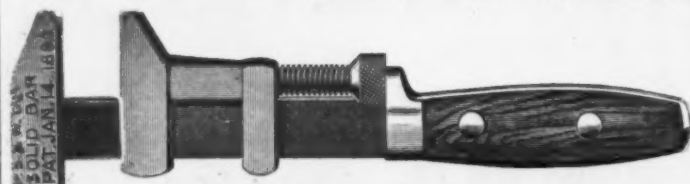
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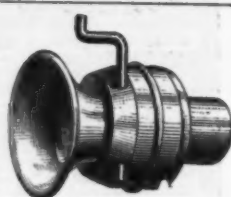
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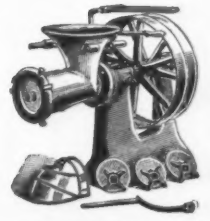
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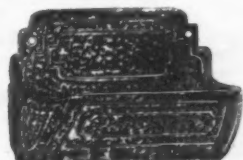
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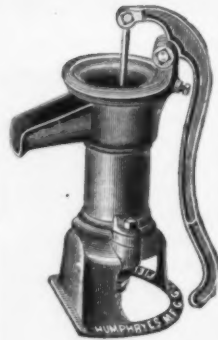
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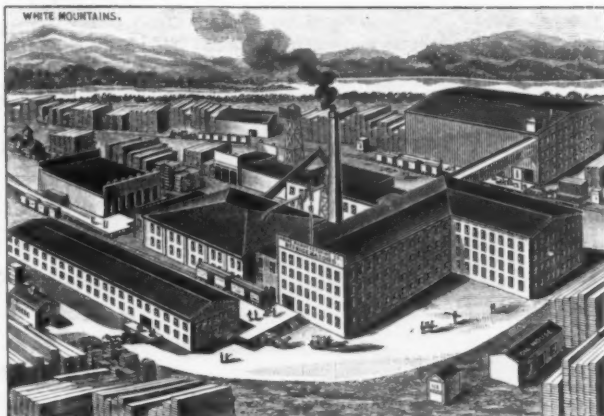
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Cuts, Cleans and Files.

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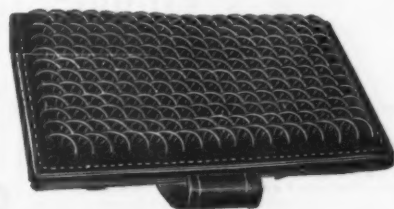


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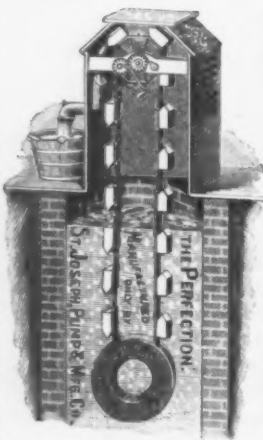
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### Water Purifier

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Is unquestionably the best machine of its kind ever offered to the public. It will cut without crushing raw or cooked meat, sea food, fruit, vegetables, etc., into coarse or fine pieces, according to the cutter used, of which three accompany each chopper.

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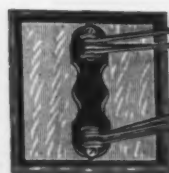
SURPLESS, DUNN & CO.,  
55 Warren Street, - - New York.  
Export Sales Agents.



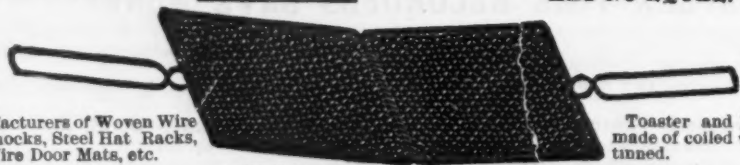
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ESPECIALLY  
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Every Machine Sold Under a Positive  
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Never leaks or drips. Rigidly built. Splendidly finished. Will wash plain clothes or the finest laces or needlework without the least injury to them—it never rubs off a button or breaks a thread, or tears the clothes in any way. Wood parts of Red Cypress. All metal parts coming in contact with the water are made of Aluminum and will not rust.

Manufactured Exclusively by the

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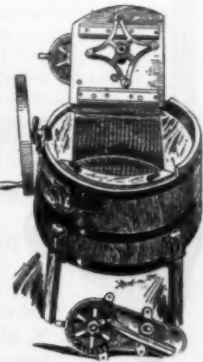
Because it is the only **ROTARY WASHER** that has **Revolving Steel Ball Gearing**, therefore light running and noiseless. No escape of steam; made of red cypress lumber; solid leg staves (not removable breakable legs); wheel turns either way; dasher reverses automatically, cleaning clothes without rubbing them to pieces. Made to last.

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They are  
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**Refilled Without Removing.**  
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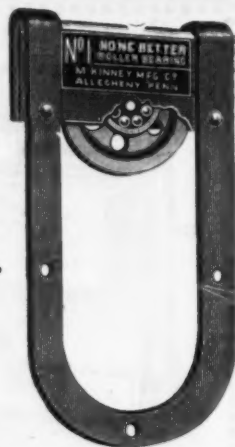
The ONLY Check that FULLY controls the Door.  
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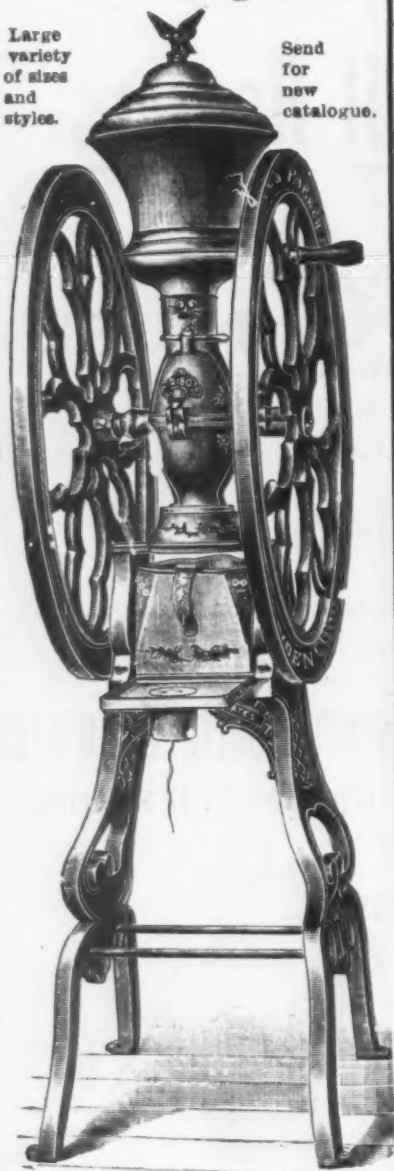


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Ball-Bearing, Rapid-Grinding

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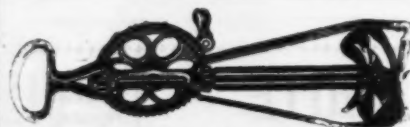


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**WIRE**  
Hammock and Clothes-Line

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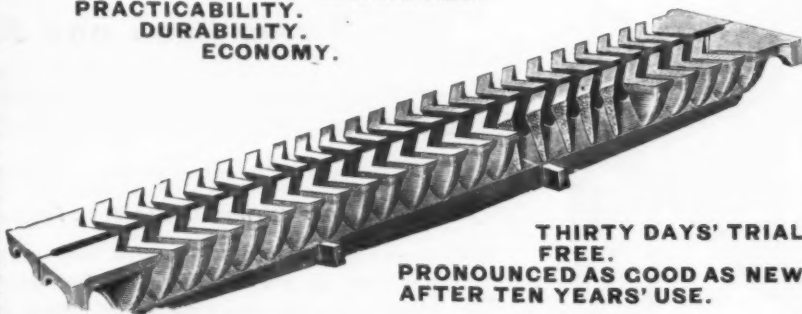


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PRONOUNCED AS GOOD AS NEW  
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"What we have done for others, we can  
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SEE OUR NEW CATALOGUE AND PRICES.

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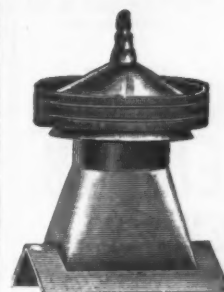


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Hardware Jobbers' orders booked  
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THE DROUVE  
VENTILATOR

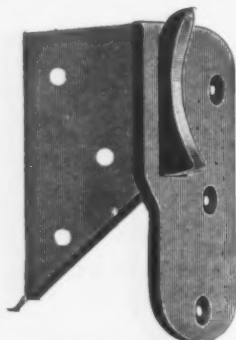
The best and cheap-  
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market. Made in all  
sizes. Send for cata-  
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COMPANY,**  
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Skylight and  
Sheet Metal Work.

# Schroeder's Patent Hangers and Fasteners

**For Storm Sash and Screens.**



**Invisible Hanger.**



**Schroeder's Patent Fastener. 10 inches Long.**

**Made from Wrought Steel. Light and Strong.**

With these hangers storm sash can be very easily and quickly put up or taken down *without the aid of ladder, nails, screws or tools of any kind.*

The fastener permits the sash to be swung out for ventilation or cleaning.

The most perfect device made for hanging storm sash and screens.



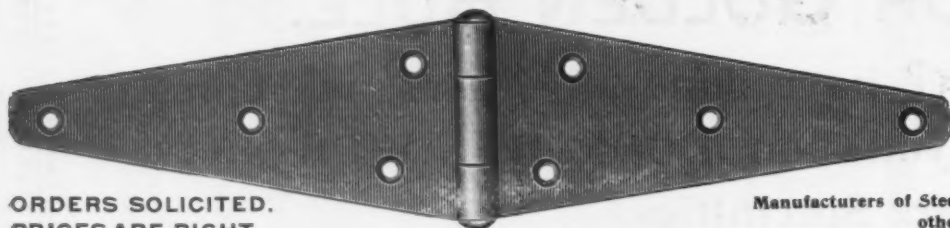
**Visible Hanger.**

**FOR SALE BY LEADING JOBBERS. SEND FOR CIRCULARS.**

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## — THE — Lawrence Common Strap AND T Hinges



ORDERS SOLICITED.  
PRICES ARE RIGHT.

Manufacturers of Steel Door Hangers, Hinges, Pulleys, and other Hardware Specialties.

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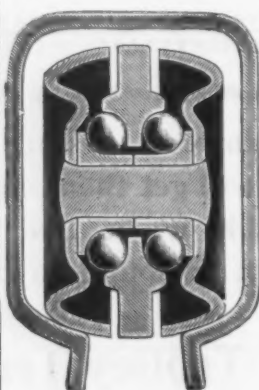
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Square and Round Weights Hang exactly from centre. Only 10 inch pockets required. Eliminates use of lead weight.

**The Hardware Dealer**

with one-sixth the stock required in one piece weights can fill any order. Weight crated with 100 lbs in a box, both plainly marked.



To secure the best device on the market for hanging sliding doors, order the McCabe Ball-Bearing Door Hanger. Write for catalogue and prices. The McCabe Hanger Mfg. Co., 540 W. 22d Street, New York.

### The Contractor

saves time, money and delay by balancing windows exactly at once.

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**WARNER LOCKS.**

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Cold Rolled Steel.  
Accurate in Construction.  
Unsurpassed in Quality.

**HARDWARE.**

Artistic in Design.  
Elegant in Finish.  
Moderate in Price.



## Lane's Steel Jack.



**NO WOOD.  
NO CAST METAL.**  
Easily sold and each customer  
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**FOUR SIZES.  
FINISH BLACK OR GALVANIZED.**

**LANE BROTHERS CO.,**  
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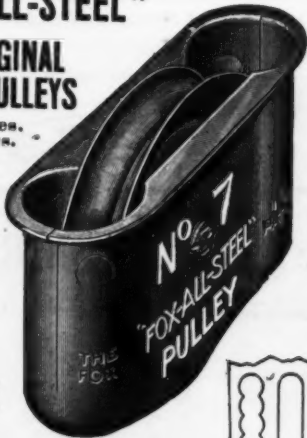
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**THE ORIGINAL  
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Two Styles,  
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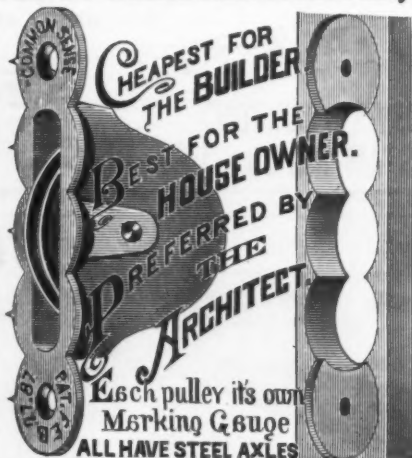
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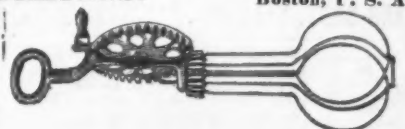
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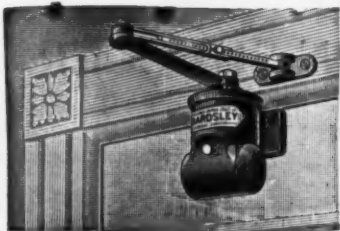
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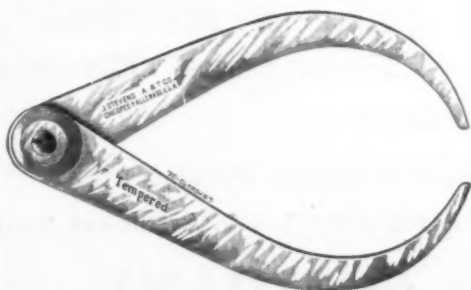
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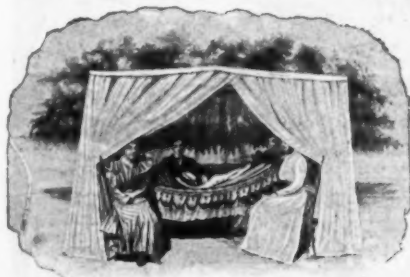
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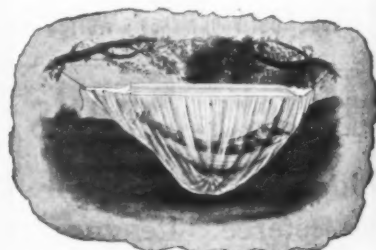


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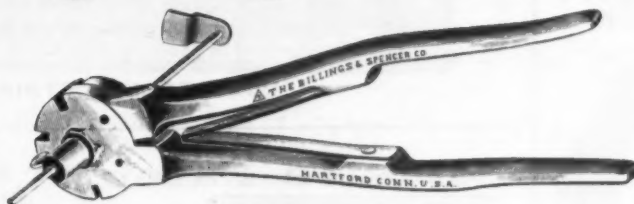
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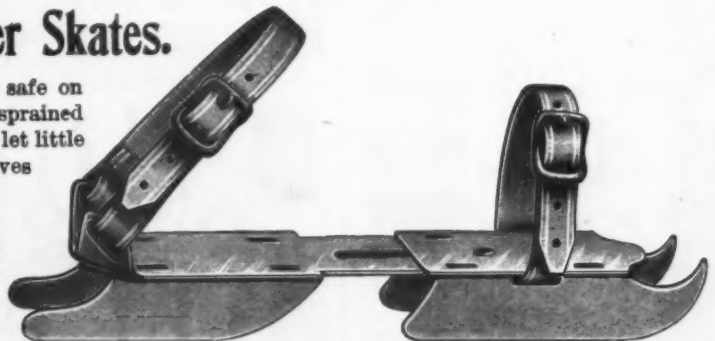
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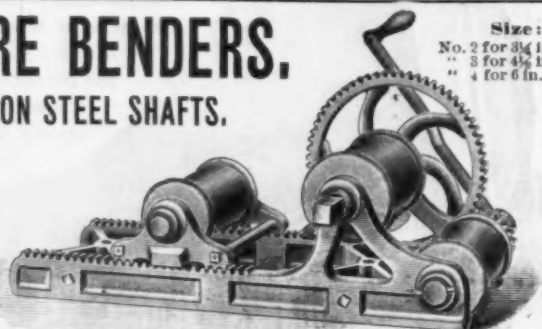
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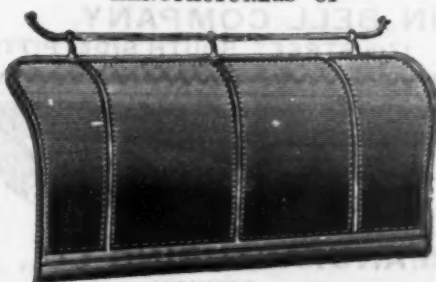


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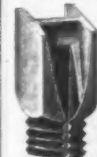
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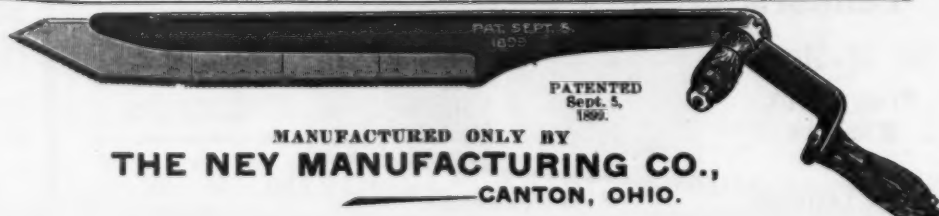
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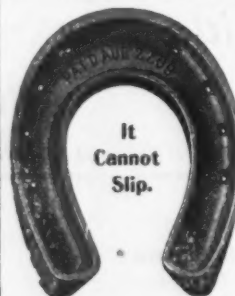


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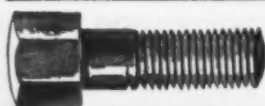


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Jeffrey Mfg. Columbus, O.  
Link-Belt Engineering Co., Phila., Pa.**Bending Rollers**Baker, Jas. H. Mfg. Co., Pittsburgh, Pa.  
Hilles & Jones Co., Wilmington, Del.  
New Doty Mfg. Co., Janesville, Wis.  
Niles Tool Works Co., 136-138 Liberty St., N. Y.**Bicycles**Johnson, Iver, Arms & Cycle Works, Fitchburg, Mass.  
Remington Arms Co., Ilion, N. Y.**Bicycle Bells—See Bells and Gongs.****Bicycle Chains**

Bridgeport Chain Co., Bridgeport, Ct.

**Bicycle Lamps**Bridgeport Brass Co., Bridgeport, Conn.  
Plume & Atwood Mfg. Co., 29 Murray St., New York.**Bicycle Machinery**Riles, E. W. Co., Brooklyn, N. Y.  
Draper Mch. Tool Co., Worcester, Mass.  
Garvin Mch. Co., Spring and Varick Sts., New York.  
Pratt & Whitney Co., Hartford, Conn.**Bicycle Parts**Davis & Buxton Stamping Co., Worcester, Mass.  
Houghton & Buxton Mfg. Co., Worcester, Mass.  
Pittsburgh Screw & Bolt Co., Pittsburgh, Pa.  
Springfield Machine Screw Co., Springfield, Mass.  
Standard Tool Co., Cleveland, O.**Bicycle Sundries**Bevin Bros. Mfg. Co., E. Hampton, Mass.  
Hungerford, U. T. Brass & Copper Co., 121 Worth St., N. Y.  
Hill, N. N. Brass Co., E. Hampton, Ct.  
Hungerford, U. T. Brass & Copper Co., 121 Worth St., N. Y.  
Smith & Egge Mfg. Co., Bridgeport, Ct.  
Supplee Hdw. Co., Phila., Pa.**Bicycle Wrenches**

Star Mfg. Co., Carpentersville, Ill.

**Blind Twine**

American Mfg. Co., 65 Wall St., N. Y.

**Bird Cages**

Hendryx, Andrew B. Co., New Haven, Conn.

**Bits**Conn. Valley Mfg. Co., Centerbrook, Ct.  
Norton Mfg. Co., Chester, Conn.**Bit Braces**

Mason &amp; Parker, Winchendon, Mass.

**Black Plate**

American Tin Plate Co., N. Y.

**Blast Forges**

Miner &amp; Peck Mfg. Co., New Haven, Ct.

**Blocks, Tackle**Boston & Lockport Block Co., Boston.  
Fulton Iron & Eng. Wks., Detroit, Mich.  
Lane Bros. Co., Poughkeepsie, N. Y.**Blowers**American Blower Co., Detroit, Mich.  
Asber, A., 109 Liberty St., N. Y.  
Bayley, Wm. & Sons Co., Milwaukee, Wis.  
Boston Blower Co., Hyde Park, Mass.  
Buffalo Forge Co., Buffalo, N. Y.  
Champion Blower & Forge Co., Lancaster, Pa.  
Cornell, J. B. & J. M., 26th St. and 11th Ave., New York City.  
Exeter Machine Wks., Boston, Mass.  
N. Y. Blower Co., Bucyrus, O.  
Panworth, H. M., 103 Liberty St., N. Y.  
Sturtevant, E. P. Co., Boston, Mass.  
Wilbraham Baker Blower Co., Phila., Pa.**Boat Hardware**

Hungerford, U. T. Brass &amp; Copper Co., 121 Worth St., N. Y.

**Boiler Makers' Machinery**

Prentice Bros., Worcester, Mass.

**Boiler Plates**Lukens Iron & Steel Co., Coatesville, Pa.  
Seldel & Hastings Co., Wilmington, Del.**Boiler Tubes**

Hungerford, U. T. Brass &amp; Copper Co., 121 Worth St., N. Y.

**Boiler Tubes, Brass**

Hungerford, U. T. Brass &amp; Copper Co., 121 Worth St., N. Y.

**Boilers, Steam**Babcock & Wilcox Co., 30 Cortlandt St.  
Cahall Sales Dept., Pittsburgh, Pa.  
Harrison Safety boiler Wks., Phila., Pa.  
Pollock, W. B. Co., Youngstown, O.  
Wetherill, Robt. & Co., Chester, Pa.  
Whitehead, W. W., Davenport, Iowa.  
Wood, Jno. Mfg. Co., Conshohocken, Pa.**Bolt Cutters**Chambers Bros., Philadelphia, Pa.  
Sellers, Wm. & Co., Inc., Phila., Pa.**Bolt and Nut Machinery**Acme Machinery Co., Cleveland, Ohio.  
Ajax Mfg. Co., Cleveland, Ohio.  
Detrick & Harvey Mch. Co., Baltimore, Md.  
Howard Iron Works, Buffalo, N. Y.  
National Machinery Co., Tiffin, Ohio.**Bolts**American Iron & Steel Mfg. Co., Lebanon, Pa.  
American Screw Co., Providence, R. I.  
Blake & Johnson, Waterbury, Conn.  
Dunham Nut Co., Unionville, Conn.  
Franklin-Moore Co., Winsted, Conn.  
Hall's Sam'l Sons, 229 W. 10th St., N. Y.  
Harris, Saml. & Co., Chicago, Ill.  
Haskell, Wm. H. Mfg. Co., Pawtucket, R. I.  
Ladd, W. C., Bristol, Conn.  
Lanz, M. & Sons, Pittsburgh, Pa.  
McCloud, Crane & Minter Co., Worcester, Mass.  
National Elastic Nut Co., Milwaukee, Wis.  
Pittsburgh Screw & Bolt Co., Pittsburgh, Pa.  
Port Chester Bolt & Nut Co., Port Chester, N. Y.  
Rhode Island Tool Co., Providence, R. I.  
Rockford Bolt Works, Rockford, Ill.  
Russell, Burdall & Ward, Port Chester, N. Y.  
Shelton Co., Birmingham, Conn.**Books**

Williams, David Company, 232-238 William Street, N. Y.

**Boring and Turning Mills**

Sellers, Wm. &amp; Co., Inc., Phila., Pa.

**Box Fixtures**

Cary Mfg. Co., 19-21 Roosevelt St., N. Y.

**Box Hasps and Hinges**

Cary Mfg. Co., 19-21 Roosevelt St., N. Y.

**Box Straps and Corners**

Cary Mfg. Co., 19-21 Roosevelt St., N. Y.

**Boxes, Hdw. Shelf, &c.**Green, A. H. & Co., 22 Park Place, N. Y.  
Jones, Jesse, Paper Box Co., Phila., Pa.  
Moore, C. P., Ravenswood, W. Va.**Brackets, Shelf**Atlas Mfg. Co., New Haven, Conn.  
Griffin Mfg. Co., Allegheny, Pa.**Brass and Copper**Ansonia Brass & Copper Co., 99 John St., N. Y.  
Bridgeport Brass Co., Bridgeport, Ct.  
Daval, John & Sons, 100 John, N. Y.  
Hungerford, U. T. Brass & Copper Co., 121 Worth St., N. Y.  
Plume & Atwood Mfg. Co., 29 Murray St., N. Y.  
Randolph-Crowe Co., Waterbury, Conn.  
Rutter, A. T., 256 Broadway, N. Y.  
Seville Mfg. Co., Waterbury, Conn.  
Shimer, H. M. & Co., Phila., Pa.  
Waterbury Brass Co., 60 Centre St., N. Y.**Brass and Copper Rods**

Hungerford, U. T. Brass &amp; Copper Co., 121 Worth St., N. Y.

**Brass and Copper Wire**

Hungerford, U. T. Brass &amp; Copper Co., 121 Worth St., N. Y.

**Brass Butt Hinges**

Hungerford, U. T. Brass &amp; Copper Co., 121 Worth St., N. Y.

**Brass Founders**Cramp, Wm. & Sons S. & E. B. Co., Philadelphia, Pa.  
Reeves, Paul S., Philadelphia, Pa.  
Ryan, J. J. & Co., Chicago, Ill.**Brass Goods**

Hungerford, U. T. Brass &amp; Copper Co., 121 Worth St., N. Y.

**Brass and Iron Jack Chains**

Hungerford, U. T. Brass &amp; Copper Co., 121 Worth St., N. Y.

**Bridge Builders**American Bridge Co., 100 B'way, N. Y.  
Boston Bridge Works, Boston, Mass.  
Eastern Bridge & Structural Co., Worcester, Mass.  
Illinois Steel Co., Chicago, Ill.  
New England Structural Co., Boston.  
Scaife, Wm. B. & Sons, Pittsburgh.**Bronze Ingots**

Syracuse Smelting Wks., Syracuse, N. Y.

**Bronze, Manganese**

Cramp, Wm. &amp; Sons S. &amp; E. B. Co., Philadelphia, Pa.

**Bronze, Tobin**

Ansonia Bronze &amp; Copper Co., 99 John St., N. Y.

**Brooms and Brushes**

Osborn Mfg. Co., Cleveland, O.

**Buffing Wheels**

Divine Bros. Co., Utica, N. Y.

**Buggies**

Parry Mfg. Co., Indianapolis, Ind.

**Builders' Hardware**Reading Hardware Co., Reading, Pa.  
Stanley Works, New Britain, Conn.  
Taylor & Boggis Fdry Co., Cleveland, O.  
U. S. Steel Lock Co., Clinton, Iowa.**Buildozers**

Williams, White &amp; Co., Moline, Ill.

**Burners Acetylene**

State Line Talc Co., Chattanooga, Tenn.

**Butchers' Saws**

Dietson, Henry &amp; Sons, Inc., Phila., Pa.

Goodell-Pratt Co., Greenfield, Mass.

Jennings, C. E. &amp; Co., 101 Reade St., N. Y.

Miller Falls Co., 28 Warren St., N. Y.

**Butchers' Tools**

Chastillon, John &amp; Sons, 35-39 Cliff St., Goodell Co., Antrim, N. H.

**Butts and Hinges—See Hinges.****Buyers' System**

Folding Paper Box Co., South Bend, Ind.

**Calibers and Dividers**Starrett, L. S. Co., Athol, Mass.  
J. Stevens Arms & Tool Co., Chicopee Falls, Mass.**Car Building Machinery**

Wood, S. A. Machine Co., So. Boston.

**Car Springs**

Scott, Chas. Spring Co., Phila., Pa.

**Carbide of Silicon**

Carborundum Co., Niagara Falls, N. Y.

**Carborundum Grains**

Carborundum Co., Niagara Falls, N. Y.

**Carborundum Wheels**

Carborundum Co., Niagara Falls, N. Y.

**Carriage Hardware**Atlas Bolt & Screw Co., Cleveland, O.  
Baker, Jas. H. Mfg. Co., Pittsburgh, Pa.  
Clapp, E. D. Mfg. Co., Auburn, N. Y.  
Eccles, Richard, Auburn, N. Y.  
McKinnon Dash Co., Buffalo, N. Y.  
Scranton Forging Co., Scranton, Pa.**Carriage and Wagon Springs**

Rowland, Wm. &amp; Harvey, Phila., Pa.

**Cars.**Atlas Bolt & Screw Co., Cleveland, O.  
Sheffield Car Co., Three Rivers, Mich.**Cartridges**Hungerford, U. T. Brass & Copper Co., 121 Worth St., N. Y.  
Peterson Cartridge Co., Cincinnati, O.  
Union Metallic Cartridge Co., 313-315 Broadway, N. Y.**Carving Tools**

Buck, Chas., Millbury, Mass.

**Case Hardening Material**

American Carburizing Co., Jersey City.

**Cash Recorders**Hough Cash Recorder Co., Indian Orchard, Mass.  
Whiting Mfg. Co., Northboro, Mass.**Casters**

Schenck, M. B. Co., Meriden, Ct.

**Castings, Atlas Metal**

Ferro-Carbon Castings Co., Phila., Pa.

**Castings, Brass, Bronze and Copper**Bridgeport Deoxidized Bronze & Metal Co., Bridgeport, Conn.  
Chapman, J. B. & Co., Springfield, Mass.  
Clark, John W., Albany, N. Y.  
Cramp, Wm. & Sons S. & E. B. Co., Philadelphia, Pa.  
Ryan, J. J. & Co., Chicago, Ill.  
West Side Foundry Co., Troy, N. Y.**Castings, Finished**

Franklin, H. H. Mfg. Co., Syracuse, N. Y.

**Castings, Iron**Albany Foundry Co., Albany, N. Y.  
Allen, E. R., Corning, N. Y.  
Barney & Reed Mfg. Co., Boston, Mass.  
Baugh Mch. Tool Co., Springfield, Mass.  
Birmingham Iron Fdry., Derby, Conn.  
Booth, The Lloyd Co., Youngstown, O.  
Baylor, Wm. & Sons Co., Milwaukee.  
Cheney, S. & Son, Manlius, N. Y.  
Chisholm & Moore Mfg. Co., Cleveland.  
Clark, John W., Albany, N. Y.  
Coddling Mfg. Co., Bristol, Conn.  
Crane, Wm. M. Co., 1131 Broadway, N. Y.  
Diamond Drill & Mch. Co., Birdsboro, Pa.**Castings, Steel**Du Bois Iron Works, Du Bois, Pa.  
Farrell Fdry & Mch. Co., Ansonia, Ct.  
Forest City Foundry & Mfg. Co., Cleveland, Ohio.  
Livermore, H. F., Boston, Mass.  
Lorain

**Cements, Iron**

Smooth On Mfg. Co., Jersey City, N. J.

**Chains**

Bradlee & Co., Philadelphia.  
Bridgeport Chain Co., Bridgeport, Ct.  
Chillicothe-Evans Chain Co., Allegheny, Pa.  
Hungerford, U. T., Brass & Copper Co., 121 Worth St., N. Y.  
Jenkins Iron & Tool Co., Howard, Pa.  
Link-Belt Engineering Co., Phila., Pa.  
McKay Jas. & Co., Pittsburgh, Pa.  
Nicholson & Co., Pittsburgh, Pa.  
Onida Community, Ltd., Niagara Falls.  
Standard Chain Co., Pittsburgh, Pa.

**Chain Plants**

Turner, Vaughn &amp; Taylor Co., Cuyahoga Falls, O.

**Chemicals**

Kemper &amp; Amend, New York.

**Cherry Stoppers**Enterprise Mfg. Co., Philadelphia. Pa.  
Goodell Co., Antrim, N. H.**Chisels**

Buck Bros., Millbury, Mass.  
Buck, Chas., Millbury, Mass.  
Jennings, C. F. Co., 101 Reade St., N. Y.  
White, L. & J. Co., Buffalo, N. Y.

**Christmas Tree Holders**

Logan & Steorridge Iron Co., New Brighton, Pa.  
North Bros. Mfg. Co., Philadelphia, Pa.

**Chucks**

Cushman Chuck Co., Hartford, Conn.  
Doebler Mfg. Co., Middletown, Conn.  
Goodell Pratt Co., Greenfield, Mass.  
Hogson & Pettis Mfg. Co., New Haven.  
Holland Mfg. Co., Erie, Pa.  
Horton, E. & Son Co., Windsor Locks, Ct.  
Ideal Machine Works, Hartford, Conn.  
Pratt Chuck Co., Frankfort, N. Y.  
Skinner Chuck Co., New Britain, Conn.  
Standard Tool Co., Cleveland, O.  
Union Mfg. Co., 108 Chambers St., N. Y.  
Whitton, D. E. Mach. Co., New London.

**Circular Sawing Machines**

Kilder, R. E., Worcester, Mass.

**Clamps**

Bentley, C. H. & Co., Chicago, Ill.  
Hall, Thos., Brooklyn, N. Y.  
Hammer & Co., Branford, Conn.

**Cleaning Rods**

Bridgeport Gun Implement Co., 318-315 Broadway, N. Y.

**Clipping Machines**

Amer. Shearer Mfg. Co., Nashua, N. H.  
Chicago Flexible Shaft Co., Chicago, Ill.  
McCoy, Jos. F. Co., 35 Warren St., N. Y.  
Wiebusch & Hilger, Ltd., 9-15 Murray St., N. Y.

**Clothes Dryers**

Bill Dryer Co., Worcester, Mass.

**Clothes Line Hooks**

Wilson, E. H. &amp; Co., Allston, Mass.

**Clothes Pins**

U. S. Clothes Pin Co., Montpelier, Vt.

**Coal**

Alabama Consolidated Coal & Iron Co., Birmingham, Ala.  
Elois Sheffield Steel & Iron Co., Birmingham, Ala.  
Washington Coal & Coke Co., Dawson, Pa.  
Wister, Francis, Philadelphia, Pa.  
Coal Picks  
Jenkins Iron & Tool Co., Howard, Pa.

**Coaster Brakes**

Graham, John H. &amp; Co., 113 Chambers St., N. Y.

**Coffee and Spice Mills**

Arcade Mfg. Co., Freeport, Ill.  
Parker, Chas. Co., Meriden, Conn.

**Coke**

Alabama Consolidated Coal & Iron Co., Birmingham, Ala.  
Bessemer Coke Co., Pittsburgh, Pa.  
Cherry Valley Iron Co., Pittsburgh, Pa.  
Dimmick, J. K. & Co., Phila., Pa.  
Frick, H. C. Coke Co., Pittsburgh, Pa.  
Houston, C. B. & Co., Philadelphia, Pa.  
Sloss Sheffield Steel & Iron Co., Birmingham, Ala.  
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.  
Virginia Iron, Coal & Coke Co., Bristol, Va., Tenn.  
Washington Coal & Coke Co., Dawson, Pa.  
Wister, Francis, Philadelphia, Pa.

**Compressed Air Machinery**

Phila. Pneumatic Tool Co., Phila., Pa.  
Condenser Tubes, Brass or Copper  
Hungerford, U. T., Brass & Copper Co., 121 Worth St., N. Y.

**Conductor Pipe**

Berger Bros. Co., Philadelphia, Pa.

**Conveying Machinery**

Aultman Co., Canton, Ohio.  
Brown Hoisting Machinery Co., Inc., Cleveland, Ohio.  
California Wire Works, San Francisco.  
Du Bois Iron Works, Du Bois, Pa.  
Hunt, C. W. Co., W. New Brighton, N. Y.  
Jeffrey Mfg. Co., Columbus, O.  
Link-Belt Engineering Co., Phila., Pa.

**Cooking Utensils**

Cleveland Stamping &amp; Tool Co., Cleveland, O.

**Coping Saw**

Jones &amp; Dommersnas, Chicago, Ill.

**Copper**

Hendricks Bros., 49 Cliff, N. Y.

**Copper Hammers**

Hungerford, U. T., Brass &amp; Copper Co., 121 Worth St., N. Y.

**Copper Rives and Burrs**

Hungerford, U. T., Brass &amp; Copper Co., 121 Worth St., N. Y.

**Copper Tacks and Nails**

Hungerford, U. T., Brass &amp; Copper Co., 121 Worth St., N. Y.

**Cordage**

Macomber &amp; White Rose Co., Chicago.

**Core Drums**

Sanson Cordage Works, Boston, Mass.

**Cork Screws and Cork Pullers**

Erle Specialty Co., Erie, Pa.

**Corn Hooks**

Whitington &amp; Cooley Mfg. Co., Jackson, Mich.

**Corn Huskers**

Wilcox Mfg. Co., Aurora, Ill.

**Corn Shellers**

Patch, A. J., Clarksville, Tenn.  
Goulds Mfg. Co., Seneca Falls, N. Y.

**Corrugated Iron and Steel**

Garry Iron &amp; Steel Roofing Co., Cleveland, O.

McLaughlin Iron Co., Wilmington, Del.

Scaife, Wm. B. &amp; Sons, Pittsburgh.

**Cotter Pin Machines, Automatic**

Shuster, F. B. Co., New Haven, Conn.

**Cotton Ties**

American Steel Hoop Co., Battery Park Building, N. Y.

**Counting Machines**

Durant, W. N. Milwaukee, Wis.  
Hart, E. A., Battle Creek, Mich.

**Couplings, Compression**

Sennett, Geo. B. Co., Youngstown, O.

**Cow Ties**

Onida Community, Ltd., Niagara Falls.

**Cranes**

Brown Hoisting Machinery Co., Inc., Cleveland, Ohio.

Chisholm &amp; Moore Mfg. Co., Cleveland.

Cleveland Crane &amp; Car Co., Cleveland, O.

Niles Tool Works Co., 138-139 Liberty St., N. Y.

Northern Engineering Works, Detroit, Mich.

Pawling &amp; Harnischfeger, Milwaukee, Wis.

Pneumatic Crane Co., Pittsburgh, Pa.

Reading Crane &amp; Hoist Wks., Reading, Pa.

Ridgway, Craig &amp; Son Co., Coatesville, Pa.

Speidel, J. G., Reading, Pa.

**Crayon**

Steward, D. M. Mfg. Co., Chattanooga, Tenn.

**Crucibles**

Dixon, Jos. Crucible Co., Jersey City, N. J.

**Cupolas**

Northern Engineering Works, Detroit.

Faxon, J. W. Co., Philadelphia, Pa.

**Cupolas, Hot Blast**

Byram &amp; Co., Detroit, Mich.

**Curry Combs**

New York Stamping Co., Brooklyn, N. Y.

**Cutlery**

Cattaraugus Cutlery Co., Little Valley, N. Y.

Chaffin, John &amp; Sons, 85 to 89 Cliff St., N. Y.

Dane, Stoddard &amp; Co., Boston.

Goodell Co., Antrim, N. H.

Kimball, C. J. Co., Bennington, N. H.

Wiebusch &amp; Hilger, Ltd., 9 to 15 Murray St., N. Y.

**Cutting Off Machines**

Hurlbut Rogers Mach. Co., So. Sudbury, Mass.

**Dampers**

Williams, A. C., Ravenna, O.

**Dashes and Fenders**

McKinnon Dash Co., Buffalo, N. Y.

**Diamond Tools**

Dickinson, Thos. L., 45 Vesey St., N. Y.

**Dies**

Adriance Mach. Works, Brooklyn, N. Y.

Bliss, E. W. Co., Brooklyn, N. Y.

Ferracute Mach. Co., Bridgeton, N. J.

Hay-Budden Mfg. Co., Brooklyn, N. Y.

Mossberg, Frank Co., Attleboro, Mass.

Richard Mfg. Co., Bloomsburg, Pa.

Wilson &amp; Smith, Worcester, Mass.

**Door Bells.—See Bells and Gongs.****Door Checks and Springs**

Bardley, Jos., 147 151 Baxter St., N. Y.

Ogden Mfg. Co., Newark, N. J.

Pullman Sash Balance Co., Rochester, N. Y.

**Door Holders**

Caldwell Mfg. Co., Rochester, N. Y.

**Draught Springs**

Burditt &amp; Williams, Boston, Mass.

**Draw Benches**

Richard Mfg. Co., Bloomsburg, Pa.

Thompson, Hugh L., Waterbury, Ct.

Vulcan Foundry &amp; Machine Co., New Castle, Pa.

**Drill Grinders**

Head, L. S. &amp; Son, Barre, Mass.

Sellers, Wm. &amp; Co., Inc., Phila., Pa.

Washburn Shops of Worcester Polytechnic Inst., Worcester, Mass.

Wilmarth &amp; Norman, Grand Rapids, Mich.

**Drill Press Work**

Straight Mfg. Co., Jamestown, N. Y.

**Drilling Machines**

Barnes, R. F. Co., Rockford, Ill.

Barnes, W. F. &amp; John Co., Rockford, Ill.

Bickford Drill &amp; Tool Co., Springfield, Mass.

Bullard Machine Tool Co., Bridgeport, Ct.

Burnham, Geo. Co., Worcester, Mass.

Champion Blower &amp; Forge Co., Lancaster, Pa.

Cincinnati Mch. Tool Co., Cincinnati, O.

Dallent, Thos. H. &amp; Co., Philadelphia.

D'Amond &amp; Littlefield Mch. Co., 131 Worth St., N. Y.

Davis, W. F., Machine Co., Rochester, N. Y.

Detrick &amp; Harvey Mch. Co., Baltimore, Md.

Fosdick &amp; Holloway Mach. Tool Co., Cincinnati, O.

Harrington, E. Son &amp; Co., Phila., Pa.

Hill, Clarke &amp; Co., Boston, Mass.

Hooper Mfg. Co., Freeport, Ill.

Niles Tool Works Co., 138-139 Liberty St., N. Y.

Prentice Bros., Worcester, Mass.

Quint, A. D., Hartford, Conn.

Shuster, F. B. Co., New Haven, Conn.

Shuler &amp; Ware, So. Bend, Ind.

Sigourney Tool Co., Hartford Conn.

Silver Mfg. Co., Salem, O.

**Slate Dwight Machine Co.**

Hartford, Ct.

Stow Flexible Shaft Co., Phila., Pa.

Wiley &amp; Russell Mfg. Co., Greenfield, Mass.

York, S. M. Co., Cleveland, O.

**Drilling Machines, Automatic**

Gould &amp; Eberhardt, Newark, N. J.

**Drive Chains**

Locke Steel Belt Co., Bridgeport, Conn.

**Drop Forgings**

Belden Machine Co., New Haven, Conn.

Killing &amp; Spencer Co., Hartford, Conn.

Cape Ann Tool Co., Pigeon Cove, Mass.

Chicago Drop Forging &amp; Fdry. Co., Kensington, Ill.

Clapp, E. D. Mfg. Co., Auburn, N. Y.

Consolidated Railway Electric Light &amp; Equipment Co., 100 Broadway, N. Y.

Eccles, Richard, Auburn, N. Y.

General Forging Co., Boonton, N. J.

Indianapolis Drop Forging Co., Indianapolis, Ind.

Ireland &amp; Matthews Mfg. Co., Detroit.

Keston Drop Forge Co., Philadelphia.

Kiborn &amp; Bishop Co., New Haven, Conn.

Page-Storms Drop Forge Co., Chicopee Falls, Mass.

R. I. Tool Co., Providence, R. I.

Scranton Forging Co., Scranton, Pa.

Seward, M. &amp; Son Co., New Haven, Ct.

Strieby &amp; Foote Co., Newark, N. J.

Transue &amp; Williams Co., Alliance, O.

Williams, J. H. &amp; Co., Brooklyn, N. Y.

Wyman &amp; Gordon, Worcester, Mass.

**Drop Hammers**

Billings &amp; Spencer Co., Hartford, Conn.

Williams, White &amp; Co., Moline, Ill.

**Drop Presses**

Manville, E. J. Mch. Co., Waterbury, Ct.

Miner &amp; Peck Mfg. Co., New Haven, Ct.

Mossberg &amp; Granville Mfg. Co., Providence, R. I.

Vulcan Iron Works, Chicago, Ill.

**Dumb Waiters**

Energy Elevator Co., Philadelphia, Pa.

Speidel, J. G., Reading, Pa.

Storm Mfg. Co., Newark, N. J.

Variety Machine Co., Warsaw, N. Y.

**Dump Cars**

Atlas Bolt &amp; Screw Co., Cleveland, O.

**Dynamoes and Motors, Electric**

Chicago House Wrecking Co., Chicago.

Kddy Electric Mfg. Co., Windsor, Conn.

General Electric Co., Schenectady, N. Y.

New England Motor Co., Lowell, Mass.

Sturtevant, E. F. Co., Boston, Mass.

Wearhouse Elec. &amp; Mfg. Co., Pittsburgh, Pa.

**Eave Trough Hangers**

Berger Bros. Co., Philadelphia, Pa.

Oatman Bros., Medina, O.

**Edge Tools**

Buck, Chas., Millbury, Mass.

Buck Bros., Millbury, Mass.

Ferro-Carbon Castings Co., Phila., Pa.

White, L. &amp; J. Co., Buffalo, N. Y.

**Egg Beaters**

Lyon, Nelson, Albany, N. Y.

Standard Co., Boston, Mass.

**Egg Opener**

Hartigan, W. R., Collinsville, Ct.

**Electric Bells and Supplies**

Strander, W. R. &amp; Co., 204 Fulton St.

**Electric Controllers**

Electric Controller &amp; Supply Co., Cleveland, O.

**Electric Lighting and Power Apparatus**

Eddy Electric Mfg. Co., Windsor, Conn.

General Electric Co., Schenectady, N. Y.

**Electrical Apparatus**

Wearhouse Elec. &amp; Mfg. Co., Pittsburgh, Pa.

**Electrotypes**

St. Louis Electrotype Foundry, St. Louis, Mo.

**Elevators, Makers of**

Eastern Machinery Co., New Haven, Ct.

Energy Elevator Co., Philadelphia, Pa.

Haven Elevator Co., Cincinnati, O.

Link-Belt Engineering Co., Phila., Pa.

Morse, Williams &amp; Co., Phila., Pa.

Ridgway, Craig &amp; Son Co., Coatesville, Pa.

Speidel, J. G., Reading, Pa.

Variety Machine Co., Warsaw, N. Y.

**Elevator Buckets**

Cleveland Elevator Bucket Co., Cleveland, O.

**Elevator Enclosures and Cabs**

Ludlow Saylor Wire Co., St. Louis, Mo.

**Emery**

Tanite Co., Stroudsburg, Pa.

**Emery Wheels**

American Emery Wheel Works, Providence, R. I.

Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.

Diamond Mach. Co., Providence, R. I.

Nazel, John, Phila., Pa.

Northampton Emery Wheel Co., Leeds, Mass.

Norton, Emery Wheel Co., Worcester, Mass.

Safety Emery Wheel Co., Springfield, O.

Springfield Mfg. Co., Bridgeport, Conn.

Sterling Emery Wheel Co., Tiffin, O.

Tanite Co., Stroudsburg, Pa.

Verified Emery Wheel Co., Westfield, Mass.

**Emery Wheel Dresser**



- Presbrey Fire Brick Co.**, Taunton, Mass.  
**Valentine, M. D. & Bro. Co.**, Woodbridge, N. J.
- Fire Extinguishers**  
**International Sprinkler Co.**, Phila., Pa.
- Fishing Tackle**  
**Dame, Stoddard & Co.**, Boston, Mass.
- Flexible Metallic Tubing**  
**Sharp, Klumph & Sisson Co.**, Chicago.
- Flexible Shafting**  
**Chicago Flexible Shaft Co.**, Chicago, Ill.  
**Stow Flexible Shaft Co.**, Phila., Pa.  
**Stow Mfg. Co.**, Binghamton, N. Y.
- Flint and Emery Paper**  
**Baeder, Adamson & Co.**, Phila., Pa.
- Floor and Ceiling Plates**  
**Codling Mfg. Co.**, Bristol, Conn.
- Flue Cleaners**  
**Jackson Plac Scraper Co.**, Jackson, Tenn.  
**Jarecki Mfg. Co.**, Erie, Pa.
- Fly Killers**  
**Bigelow, J. F.**, Worcester, Mass.
- Foot Rests**  
**Star Heel Plate Co.**, Newark, N. J.
- Forges, Portable, &c.**  
**Bradley Co.**, Syracuse, N. Y.  
**Champion Blower & Forge Co.**, Lancaster, Pa.  
**Fairbanks Co.**, 511 Broadway, N. Y.  
**Sturtevant, B. F. Co.**, Boston, Mass.
- Forgings, Iron and Steel**  
**Baker, Jas. H. Mfg. Co.**, Pittsburgh, Pa.  
**Bethlehem Steel Co.**, S. Bethlehem, Pa.  
**Eastern Forge Co.**, Boston, Mass.  
**Frankford Steel Co.**, Phila., Pa.  
**Hay-Budden Mfg. Co.**, Brooklyn, N. Y.  
**Otis Steel Co., Ltd.**, Cleveland, Ohio.  
**Pittsburgh Shear, Knife & Machine Co.**, Pittsburgh, Pa.  
**Titusville Forge Co.**, Titusville, Pa.  
**Vulcanus Forging Co.**, Cleveland, O.
- Forks, Hay and Manure**  
**Continental Tool Co.**, Frankfort, N. Y.  
**Iowa Farming Tool Co.**, Ft. Madison, Ia.  
**Withington & Cooley Mfg. Co.**, Jackson
- Foundry Facings**  
**Obermayer, S. Co.**, Cincinnati, O.
- Foundry Lamps**  
**Forest City Fdy. & Mfg. Co.**, Cleveland.  
**Paxson, J. W. Co.**, Phila., Pa.
- Foundry Supplies**  
**Gilmour, J., Bennett Building**, N. Y.  
**Obernauer, S. Co.**, Cincinnati, Ohio.  
**Osborn Mfg. Co.**, Cleveland, O.  
**Paxson, J. W. Co.**, Phila., Pa.  
**Poinier & Lester**, Toledo, O.
- Friction Clutches**  
**Eastern Machinery Co.**, New Haven, Ct.  
**Hess, Snyder & Co.**, Massillon, O.
- Furnaces, Foundry**  
**Byram & Co.**, Detroit, Mich.
- Furnaces, Oil, Gas and Coal**  
**Rockwell Engineering Co.**, 26 Cortlandt St., N. Y.
- Fuses**  
**Ensign Blackford & Co.**, Simsbury, Ct.
- Gages**  
**Crosby Steam Gage & Valve Co.**, Boston.
- Galvanized Ware**  
**Keen & Ragerty Mfg. Co.**, Baltimore.
- Galvanizing**  
**Blackman & King**, 801 Greenwich St., N. Y.  
**Empire Pipe Bending & Supply Co.**, Brooklyn, N. Y.
- Galvanizing Process**  
**U. S. Electro Galvanizing Co.**, 348 Broadway, N. Y.
- Garden Rakes**  
**Cronk Hanger Co.**, Elmira, N. Y.  
**Jenkins Iron & Tool Co.**, Howard, Pa.
- Garden Tools**  
**Withington & Cooley Mfg. Co.**, Jackson
- Gas Compressor**  
**Uehling, Stainbart & Co., Ltd.**, Carlstadt, N. J.
- Gas Compressors**  
**Norwalk Iron Works Co.**, So. Norwalk.
- Gas Furnaces**  
**A. M. Gas Furnace Co.**, 23 John St., N. Y.  
**Chicago Flexible Shaft Co.**, Chicago, Ill.
- Gaskets, Iron**  
**Smooth On Mfg. Co.**, Jersey City, N. J.
- Gas Producers**  
**Duff Patents Co.**, Allegheny, Pa.  
**Smythe, S. R. Co., Inc.**, Pittsburgh, Pa.  
**Swindell, W. & Bro.**, Pittsburgh, Pa.
- Gauges, Rolling Mill**  
**Haines Gauge Co.**, Philadelphia, Pa.
- Gears**  
**Boston Gear Works**, Boston, Mass.  
**Gleason Tool Co.**, Rochester, N. Y.  
**Morse, Williams & Co.**, Phila., Pa.  
**Nuttall, R. D. Co.**, Pittsburgh, Pa.  
**Pool, Robt. Son & Co.**, Baltimore, Md.
- Gears, Rawhide**  
**Horsburgh & Scott**, Cleveland, Ohio.
- Gear Cutters**  
**Becker Brainerd Milling Machine Co.**, Hyde Park, Mass.  
**Gould & Eberhardt**, Newark, N. J.  
**Whitton, D. E. Mch. Co.**, New London.
- Generators, Electric**  
**Westinghouse Elec. & Mfg. Co.**, Pittsburgh, Pa.
- Gimlets**  
**Noton Mfg. Co.**, Chester, Conn.
- Glass Cutters**  
**Barrett, W. L.**, Bristol, Conn.  
**Boltman, F. H. & Co.**, Cleveland, O.  
**Monce, S. G.**, Unionville, Conn.  
**Smith & Hemenway Co.**, 295 Broadway, N. Y.
- Glass Cutting Boards**  
**Lufkin Rule Co.**, Saginaw, Mich.
- Glue**  
**Baeder, Adamson & Co.**, Phila., Pa.
- Golf Woods**  
**Bridgeport Gun Implement Co.**, 812 Broadway, N. Y.
- Gongs—See Bells and Gongs.**
- Grate Bars**  
**Stowell Mfg. & Fdry. Co.**, So. Milwaukee, Wis.
- Grates, Rocking**  
**Sennett, Geo. B. Co.**, Youngstown, O.
- Grease, Axle**  
**Snow Flake Axle Grease Co.**, Boston.
- Grinding and Polishing Mchs.**  
**American Emery Wheel Works**, Providence, R. I.  
**Barnes, W. F. & John Co.**, Rockford, Ill.  
**Bealy, Chas. H. & Co.**, Chicago, Ill.  
**Brown & Sharpe Mfg. Co.**, Providence.  
**Cincinnati Milling Mach. Co.**, Cincinnati, O.  
**Diamond Mach. Co.**, Providence, R. I.  
**Landis Tool Co.**, Waynesboro, Pa.  
**Northampton Emery Wheel Co.**, Leeds, Mass.  
**Norton Emery Wheel Co.**, Worcester, Mass.  
**Safety Emery Wheel Co.**, Springfield, O.  
**Springfield Mfg. Co.**, Bridgeport, Conn.  
**Tanite Co.**, Stroudsburg, Pa.  
**Universal Mach. Co.**, Providence, R. I.  
**Wilmarth & Morman**, Grand Rapids
- Grindstones**  
**Atlantic Grindstone Co.**, Providence.  
**Cleveland Stone Co.**, Cleveland, O.
- Grabbing Machine**  
**New Century Mfg. Co.**, 43 E. 8th St., N. Y.
- Guns**  
**Harrington & Richardson Arms Co.**, Worcester, Mass.  
**Johnson, Iver Arms & Cycle Works**, Fitchburg, Mass.  
**Marlin Fire Arms Co.**, New Haven, Ct.  
**Remington Arms Co.**, 815 Broadway, New York
- Hack Saws**  
**Diston, Henry & Sons, Inc.**, Phila., Pa.  
**Goodell-Pratt Co.**, Greenfield, Mass.  
**Springfield Machine Screw Co.**, Springfield, Mass.  
**Starrett, L. S. Co.**, Athol, Mass.
- Hammers**  
**Heller Bros. Co.**, Newark, N. J.  
**Logan & Strobbridge Iron Co.**, New Brighton, Pa.
- Hammerheads**  
**Palmer, I. E.**, Middletown, Conn.  
**Bicknell Hdw. Co.**, Janesville, Wis.
- Hand Screws**  
**Bliss, R. Mfg. Co.**, Pawtucket, R. I.
- Hand Seed Drills**  
**Rateman Mfg. Co.**, Grenloch, N. J.
- Handle Machinery**  
**Defiance Machine Works**, Defiance, O.
- Hangers, Barn Door**  
**Myers, F. E. & Bro.**, Ashland, O.
- Hangers, Door**  
**Chicago Spring Butt Co.**, Chicago, Ill.  
**Coburn Trolley Track Mfg. Co.**, Holyoke, Mass.  
**Cronk Hanger Co.**, Elmira, N. Y.  
**Lane Bros.**, Poughkeepsie, N. Y.  
**Lawrence Bros.**, Sterling, Ill.  
**Louden Machinery Co.**, Fairfield, Iowa.  
**McCabe Hanger Mfg. Co.**, 593-543 W. 22d St., N. Y.  
**McKinney Mfg. Co.**, Allegheny, Pa.  
**Ney Mfg. Co.**, Canton, Ohio.  
**Stowell Mfg. & Foundry Co.**, So. Milwaukee, Wis.  
**Wilcox Mfg. Co.**, Aurora, Ill.
- Hangers, Shafting**  
**Ball Bearing Co.**, Boston, Mass.  
**Dodge Mfg. Co.**, Mishawaka, Ind.
- Hardware Comm'n Merchants**  
**Graham, Jno. H. & Co.**, 113 Chambers St., N. Y.  
**Hungerford, U. T.**, Braas & Copper Co., 121 Worth St., N. Y.
- Hardware Jobbers**  
**Supplee Hdw. Co.**, Phila., Pa.
- Hardware Manufacturers**  
**Arcade Mfg. Co.**, Freeport, Ill.  
**Central Hardware Co.**, Phila.  
**Logan & Strobbridge Iron Co.**, New Brighton, Pa.  
**Millers Falls Co.**, 23 Warren St., N. Y.  
**Ney Mfg. Co.**, Canton, Ohio.  
**Nicol & Co.**, Chicago, Ill.  
**Parker, Chas. Co.**, Meriden, Conn.  
**Peck, Stow & Wilcox Co.**, 21 Murray St., N. Y.  
**Stanley Works**, New Britain, Conn.  
**Union Mfg. Co.**, 103 Chambers St., N. Y.  
**Van Wagoner & Williams Hdw. Co.**, Cleveland, O.  
**Wrightsville Hdw. Co.**, Wrightsville, Pa.
- Hardware Mfrs.' Agents**  
**Graham, John H. & Co.**, 113 Chambers St., N. Y.  
**Wiebusch & Hilger, Ltd.**, 9-15 Murray St., N. Y.
- Hardware Shelving**  
**Warren, J. D. Mfg. Co.**, Chicago, Ill.
- Hardware Specialties**  
**Acme Shear Co.**, Bridgeport, Conn.  
**Berger Bros. Co.**, Philadelphia, Pa.  
**Enterprise Mfg. Co.**, of Pa., Phila., Pa.  
**Graham, John H. & Co.**, 113 Chambers St., N. Y.  
**Pleuger & Henger Mfg. Co.**, St. Louis.  
**Seranton & Co.**, The, New Haven, Ct.  
**Smith & Egge Mfg. Co.**, Bridgeport, Ct.
- Harness Snaps**  
**Cover Mfg. Co.**, West Troy, N. Y.  
**Cover's Saddlery Wks.**, Farmer, N. Y.  
**Imperial Bit & Snap Co.**, Racine, Wis.
- Haps and Staples**  
**McKinney Mfg. Co.**, Allegheny, Pa.
- Hatchets**  
**Jenkins Iron & Tool Co.**, Howard, Pa.
- Hay Knives**  
**Clark & Parsons Co.**, E. Wilton, Me.  
**Ney Mfg. Co.**, Canton, Ohio.
- Hay Tools**  
**Louden Machinery Co.**, Fairfield, Iowa.  
**Myers, F. E. & Bro.**, Ashland, O.  
**Ney Mfg. Co.**, Canton, O.
- Heating and Ventilating Apparatus**  
**American Blower Co.**, Detroit, Mich.  
**Bayley, Wm. & Sons Co.**, Milwaukee.  
**Boston Blower Co.**, Hyde Park, Mass.  
**Buffalo Forge Co.**, Buffalo, N. Y.  
**Sturtevant, B. F. Co.**, Boston, Mass.
- Heel Plates**  
**Star Heel Plate Co.**, Newark, N. J.
- Hinges**  
**Jenkins Iron & Tool Co.**, Howard, Pa.  
**Lawrence Bros.**, Sterling, Ill.  
**McKinney Mfg. Co.**, Allegheny, Pa.  
**Stanley Works**, New Britain, Conn.  
**Tiebout, W. & J.**, 113 Chambers St., N. Y.
- Hitching Posts**  
**Hartman Mfg. Co.**, 309 Broadway, N. Y.
- Hoos, Garden, Planters', &c.**  
**Continental Tool Co.**, Frankfort, N. Y.  
**Iowa Farming Tool Co.**, Fort Madison.  
**Jenkins Iron & Tool Co.**, Howard, Pa.
- Holists, Air**  
**Pedrick & Ayer Co.**, Philadelphia, Pa.  
**Ridgway, Craig & Son Co.**, Coatesville, Pa.
- Holists, Chain and Rope**  
**Edgerton, C. G.**, 240 Centre St., N. Y.  
**Fulton Iron & Engine Works**, Detroit, Mich.  
**Harrington, E. Son & Co.**, Phila., Pa.  
**McCoy, Jos. F. & Co.**, 26 Warren St.  
**Reading Crane & Hoist Works**, Reading, Pa.  
**Spedel, J. G.**, Reading, Pa.
- Holisting Machines**  
**Eastern Machinery Co.**, New Haven, Ct.  
**Lidgerwood Mfg. Co.**, 96 Liberty St., N. Y.
- Hollow Mill**  
**Geometric Drill Co.**, Westville, Conn.
- Hollow Ware**  
**Avery Stamping Co.**, Cleveland, Ohio.  
**Cleveland Stamping & Tool Co.**, Cleveland, O.  
**New York Stamping Co.**, Brooklyn, N. Y.  
**Rogers, Jno. M.**, Boat-Gauge & Drill Works, Gloucester, City, N. J.
- Horse Nails**  
**Capwell Horse Nail Co.**, Hartford, Ct.  
**Mooney, W. M. & Co.**, Ausable Chasm, N. Y.  
**National Horse Nail Co.**, Vergennes, Vt.  
**Putnam Nail Co.**, Newmarket, Boston.  
**Wiebusch & Hilger, Ltd.**, 9-15 Murray St., N. Y.
- Horse and Mule Shoes**  
**American Steel & Wire Co.**, Chicago, Ill.  
**Burden Iron Co.**, Troy, N. Y.  
**Hollow Grip Horse Shoe Co.**, Chicago.  
**Phoenix Horse Shoe Co.**, Poughkeepsie, Rhode Island Perkins Horse Shoe Co., Providence, R. I.
- Hosier, Netting Co.**, Boston, Mass.  
**Peerless Rubber Mfg. Co.**, 16 Warren Street, New York.
- Hose Coupling, Air**  
**Pedrick & Ayer Co.**, Philadelphia, Pa.
- Hose Washers**  
**Cannfield, H. O.**, Bridgeport, Conn.
- House Furnishing Specialties**  
**Lloyd Mfg. Co.**, Minneapolis, Minn.  
**Williams, A. C.**, Ravenna, O.
- Hydraulic Jacks**  
**Dudgeon, Richard**, 24 Columbia St., N. Y.  
**Henderson, A. L. Sons**, Wilmington, Del.  
**Watson-Stillman Co.**, 204 E. 43d St., N. Y.
- Hydraulic Machinery**  
**Watson-Stillman Co.**, 204 E. 43d St., N. Y.
- Hydraulic Presses**  
**Cornell, J. B. & J. M.**, 26th St. and 11th Ave., N. Y.
- Hydraulic Tools**  
**Watson-Stillman Co.**, 204 E. 43d St., N. Y.  
**Wood, R. D. & Co.**, Phila., Pa.
- Ice Cream Freezers**  
**North Bros. Mfg. Co.**, Philadelphia, Pa.  
**White Mountain Freezer Co.**, Nashua, N. H.
- Ice Making Machinery**  
**York Mfg. Co.**, York, Pa.
- Ice Picks**  
**Erie Specialty Co.**, Erie, Pa.
- Ice Shredders**  
**Enterprise Mfg. Co.**, Philadelphia, Pa.  
**Erie Specialty Co.**, Erie, Pa.
- Ice Tools**  
**Gerlach, Peter & Co.**, Cleveland, O.  
**Williams, A. C.**, Ravenna, O.  
**Wood, Wm. T. & Co.**, Arlington, Mass.
- Injectors**  
**Jenkins Bros.**, New York.  
**Lunkensheimer Co.**, Cincinnati, Ohio.  
**Watson, N. A.**, Erie, Pa.
- Insurance, Boiler**  
**Hartford Steam Boiler Inspection and Insurance Co.**, Hartford, Conn.
- Iron and Steel, Swedish**  
**Harvey, Arthur C. Co.**, Boston, Mass.  
**Lillenberg, N.**, 180 Broadway, N. Y.  
**Millen, A. & Co.**, 1 Broadway, N. Y.  
**Potts, Horace T. & Co.**, Phila., Pa.
- Iron Commission Brokers**  
**Cabene & Co.**, Phila., Pa.  
**Cotton, Barclay W. & Co.**, Phila., Pa.  
**Cox, Justice, Jr. & Co.**, Ltd., Phila., Pa.  
**Etting, Edw. J.**, Philadelphia.  
**Keeley, Jerome & Co.**, Philadelphia.  
**Law, Ernest & Co.**, Phila., Pa.  
**Levi, Henry & Co.**, Philadelphia.  
**Lee, J. Tatnell & Co.**, Philadelphia.  
**Mohr, J. J.**, 430 Walnut St., Philadelphia.  
**Wister, L. & R. Co.**, Phila., Pa.
- Iron Manufacturers**  
**Newark, J. B. & Co.**, Philadelphia, Pa.  
**Republic Iron & Steel Co.**, Chicago, Ill.  
**Merchants.**  
**Hole, Ross & Co.**, Pittsburgh, Pa.  
**Cotton, Barclay W. & Co.**, Phila.  
**Cunliffe, R. M.**, Phila., Pa.  
**Law, Ernest & Co.**, Phila., Pa.  
**Ogden & Wallace**, 577-533 Greenwich St., N. Y.
- Pierson & Co.**, 29 Broadway, N. Y.  
**Potts, Horace T. & Co.**, Phila., Pa.  
**Thomson, W. H. & Co.**, Phila., Pa.  
**Wallace, Wm. H. & Co.**, 66 B'way, N. Y.  
**Wheeler, Mifflin & Co.**, Phila., Pa.  
**Wilson, E. H. & Co.**, Philadelphia.  
**Importers**  
**Wheelock-Lovejoy & Co.**, New York and Boston.
- Iron, Galvanized Sheet—See Sheets Galvanized.**
- Iron, Sheet—See Sheets, Iron and Steel, Iron Ore**  
**Nicoll, B. & Co.**, 59-61 Wall St., N. Y.  
**Phillips & Crane**, Phila., Pa.  
**Pullman, J. Wesley**, Phila., Pa.
- Iron Shutters**  
**American Bridge Co.**, 100 B'way, N. Y.
- Ironwork, Ornamental**  
**Adam, W. J.**, Joliet, Ill.  
**Barnum, E. T.**, Detroit, Mich.  
**Berthe, A.**, Jersey City, N. J.  
**Ornamental Iron & Wire Co.**, Chattanooga, Tenn.  
**Van Dorn Iron Wks. Co.**, Cleveland, O.
- Joist Hanger**  
**Clark, W. J. & Co.**, Salem, O.  
**Van Dorn Iron Wks. Co.**, Cleveland, O.
- Keys**  
**Bell, Edwin & Co.**, Pittsburgh.
- Key Rings**  
**Snow, L. T.**, New Haven, Conn.
- Keys, Machine**  
**Morton Mfg. Co.**, Muskegon Heights, Mich.
- Keys, Split and Riveted**  
**Hollinger Fence Co.**, Greenville, O.
- Keyway Cutters**  
**Moran Mfg. Co.**, Muskegon Heights, Mich.
- Knife and Tool Grinder**  
**Union Mfg. Co.**, Buffalo, N. Y.
- Knives**  
**Kimball, C. J. Co.**, Bennington, N. H.
- Laboratory Outfits**  
**Elmer & Amend**, New York.
- Ladies, Melting**  
**Clark, W. J. & Co.**, Salem, O.
- Lamps, Gasoline**  
**Noite Brass Co.**, Springfield, O.
- Lasts and Last Stands**  
**Kupferle, Jno. C.**, St. Louis, Mo.  
**Pleuger & Henger Mfg. Co.**, St. Louis, Mo.  
**Stowell Mfg. & Foundry Co.**, So. Milwaukee, Wis.
- Lathe Dogs**  
**Harris, Saml. & Co.**, Chicago, Ill.  
**LeCount, Wm. G.**, So. Norwalk, Conn.
- Lathes**  
**American Tool Works Co.**, Cincinnati, Ohio.  
**Barker-Chard Mch. Tool Co.**, Cincinnati, Ohio.  
**Barnes, B. F. & Co.**, Rockford, Ill.  
**Brown & Sharpe Mfg. Co.**, Providence, R. I.  
**Bullard Mach. Tool Co.**, Bridgeport, Ct.  
**Davis, W. P. Machine Co.**, Rochester, N. Y.  
**Draper Mch. Tool Co.**, Worcester, Mass.  
**Fish, H. G. Mch. Works**, Worcester, Mass.  
**Harrington, E. Son & Co.**, Phila., Pa.  
**Johnson, Israel H., Jr. & Co.**, Phila., Pa.  
**Jones & Lamson Mch. Co.**, Springfield, Vt.  
**Loge & Shipley Mch. Tool Co.**, Cincinnati, O.  
**McCabe, J. J.**, 14 Day St., N. Y.  
**New Haven Mfg. Co.**, New Haven, Ct.  
**Pond Machine Tool Co.**, Plainfield, N. J.  
**Potter & Johnson Co.**, Pawtucket, R. I.  
**Pratt & Whitney Co.**, Hartford, Conn.  
**Prentice Bros.**, Worcester, Mass.  
**Schumacher & Boye**, Cincinnati, O.  
**Seneca Falls Mfg. Co.**, Seneca Falls, N. Y.  
**Young, W. O. Mfg. Co.**, Worcester, Mass.
- Lathe Tools**  
**Hill Tool Co.**, Anderson, Ind.
- Lathing, Wire**  
**Clinton Wire Cloth Co.**, Clinton, Mass.  
**N. J. Wire Cloth Co.**, Trenton, N. J.  
**Wright & Colton Wire Cloth Co.**, Worcester, Mass.
- Lawn Mowers**  
**Blair Mfg. Co.**, Springfield, Mass.  
**Supplies Hardware Co.**, Phila., Pa.
- Lawn Mower Sharpeners**  
**Wilcox Mfg. Co.**, Aurora, Ill.
- Lawn Sprinklers**  
**Kupferle, Jno. C.**, St. Louis, Mo.  
**McGowan, John H. Co.**, Cincinnati, O.  
**Pleuger & Henger Mfg. Co.**, St. Louis, Mo.
- Lemon Squeezers**  
**Hazen & Reid**, Troy, N. Y.  
**Williams, A. C.**, Ravenna, O.
- Link Belting**  
**Buhl Malleable Co.**, Detroit, Mich.
- Locks and Knobs**  
**Central Hardware Co.**, Phila., Pa.  
**Reading Hdw. Co.**, Reading, Pa.  
**U. S. Steel Lock Co.**, Clinton, Iowa.
- Locomotives**  
**Everton, B. W.**, Pittsburgh, Pa.
- Lorging Tools**  
**Gerlach, Peter & Co.**, Cleveland, Ohio.
- Lubricants**  
**Dixon, Joe**, Crucible Co., Jersey City.  
**Snow Flake Axle Grease Co.**, Boston.
- Lubricators**  
**Lunkensheimer Co.**, Cincinnati, O.
- Lumbering Tools**  
**Morley Bros.**, Saginaw, Mich.
- Lunch Boxes**  
**Seavey Mfg. Co.**, Boston, Mass.
- Machinery**  
**Acme Machinery Co.**, Cleveland, Ohio.  
**Affleck, Geo. E.**, 109 Liberty St., N. Y.  
**Ajax Mfg. Co.**, Cleveland, Ohio.

**American Tool Wks. Co., Cincinnati, O.**  
 Baird, U. Machinery Co., Pittsburgh, Pa.  
 Barnes, W. F. & John Co., Rockford, Ill.  
 Baugh Mch. Tool Co., Springfield, Mass.  
 Becker-Brinard Milling Mach. Co., Hyde Park, Mass.  
 Bliss E. W. Co., Brooklyn, N. Y.  
 Bowler, Geo. H., Cleveland, O.  
 Briggs, Marvin, 13 Broadway, N. Y.  
 Brown & Sharpe Mfg. Co., Providence.  
 Bullard Mch. Tool Co., Bridgeport, Ct.  
 Carlin Machinery & Supply Co., Allegheny, Pa.  
 Carlin's Sons Thos., Allegheny, Pa.  
 Chicago House Wrecking Co., Chicago.  
 Cincinnati Milling Mach. Co., Cin. O.  
 Cincinnati Planer Co., Cincinnati, O.  
 Conrad, T. F., Phila., Pa.  
 Cornell, J. B. & J. M., 24th St. and 11th Ave., New York City.  
 Cowdrey, C. H. Mach. Wks., Pittsburgh, Mass.  
 Davis, W. P. Machine Co., Rochester.  
 Dawson, A. L. & Co., Chicago, Ill.  
 Dawson & Goodwin, Chicago.  
 Detrick & Harvey Mch. Co., Baltimore, Md.  
 Diamond Drill & Mch. Co., Birdsboro, Pa.  
 Donah, J. B. & Co., Chicago, Ill.  
 Draper Mach. Tool Co., Worcester, Mass.  
 Du Bois Iron Works, Du Bois, Pa.  
 Farrell Fdry & Mch. Co., Ansonia, Conn.  
 Ferracute Machine Co., Bridgeport, N. J.  
 Fish, H. C. Machine Works, Worcester, Mass.  
 Garvin Machine Co., Spring and Varick Sts., N. Y.  
 General Supply Co., 40 John St., N. Y.  
 Geometric Drill Co., Westville, Conn.  
 Gray, Robt. J., 52-54 E. 13th St., N. Y.  
 Hannan & Pinton, Springfield, Mass.  
 Hendey Machine Co., Torrington, Conn.  
 Hill, Henry F., Boston, Mass.  
 Hill, Clarke & Co., Boston, Mass.  
 Illinois Maintenance Co., Chicago, Ill.  
 Johnson, Israel H., Jr., & Co., Phila.  
 Johnson, Wm. C. & Sons Mch. Co., St. Louis, Mo.  
 Kaiser, A. V. & Co., Phila., Pa.  
 Keagy & Lear Mch. Co., Cohocton, O.  
 Lodge & Shipley Mch. Tool Co., Cin. O.  
 Lund, S. T., Boston, Mass.  
 McCabe, J. J., 14 Day Street, N. Y.  
 McDowell & Co., Pittsburgh, Pa.  
 McDowell Stocker & Co., Chicago.  
 Machinists' Supply Co., Rochester, N. Y.  
 Manning, Maxwell & Moore, 55-59 Liberty St., N. Y.  
 Manville, E. J. Mach. Co., Waterbury, Ct.  
 Marshall & Hueschart Mch. Co., Chicago, Ill.  
 Mosberg, Frank Co., Attleboro, Mass.  
 National Machinery Co., Tiffin, Ohio.  
 New Doty Mfg. Co., Janesville, Wis.  
 New Haven Mfg. Co., New Haven, Conn.  
 New York Machinery Depot, 178 Broadway, New York.  
 Niles Tool Works Co., 138 Liberty St., N. Y.  
 Nilson, A. H. Mch. Co., Bridgeport, Ct.  
 Paradox Machinery Co., Chicago, Ill.  
 Pennsylvania Machine Co., Phila., Pa.  
 Phila. Machine Tool Co., Phila., Pa.  
 Pittsburgh Mfg. Co., Pittsburgh, Pa.  
 Pond Machine Tool Co., Plainfield, N. J.  
 Poole, Robt. & Son Co., Baltimore, Md.  
 Potter & Johnston Co., Pawtucket, R. I.  
 Poulterer & Co., Phila., Pa.  
 Pratt & Whitney Co., Hartford, Conn.  
 Prentice Bros., Worcester, Mass.  
 Prentiss Tool & Supply Co., 115 Liberty St., N. Y.  
 Rainier & Williams, Chicago, Ill.  
 Reade, Wm. A. & Co., Cleveland, O.  
 Seyfert's Sons L. F., Philadelphia, Pa.  
 Sigourney Tool Co., Hartford, Conn.  
 Standard Machinery & Equipment Co., Cleveland, O.  
 Thomas & Lowe Machinery Co., Providence, R. I.  
 Toomey, Frank, Philadelphia, Pa.  
 Waterbury Farrel Foundry & Mch. Co., Waterbury, Conn.  
 Wetherill, Robert & Co., Chester, Pa.  
 Wickes Bros., Pittsburgh, Pa.  
 Windsor Machine Co., Windsor, Vt.  
 Worner, C. C., Troy, Co., Detroit, Mich.  
 York, M. Co., Cleveland, O.

**Machinery, Wood Working**  
 DeLuce Machine Wks., DeLancey, O.  
 F. J. J. & Egan Co., Cincinnati, O.

**Machinery Springs**  
 Scott, Chas. Spring Co., Phila., Pa.

**Machinery Builders**  
 Chapman, J. B. & Co., Springfield, Mass.

**Machine Knives**  
 Loyd, John Co., 558-563 Water St., N. Y.

**Machine Needles**  
 Excelsior Needle Co., Torrington, Ct.

**Machine Screws—See Screws, Machine**

**Machine Screw Work**  
 Spencer Automatic Mch. Screw Co., Hartford, Conn.

**Machine Tools—See Machinery**

**Machine Work**  
 Small, R. L. & Co., Pittsburgh, Pa.

**Machine Wrenches**  
 Billings & Spencer Co., Hartford, Conn.

**Machinists' Scales**  
 Starrett, L. S. Co., Athol, Mass.

**Machinists' Tools and Supplies**  
 Billings & Spencer Co., Hartford, Conn.  
 General Supply Co., 40 John St., N. Y.  
 Keystone Mfg. Co., Buffalo, N. Y.  
 King, J. M. & Co., Waterford, N. Y.

**Magnetic Separators**  
 Cresson, Geo. V. Co., Phila., Pa.

**Manganese Bronze**  
 Hungerford, U. T. Brass & Copper Co., 121 Worth St., N. Y.

**Manufacturing Properties**  
 Harrisburg Fdry & Mch. Wks., Harrisburg, Pa.  
 Hillman, J. H. & Co., Pittsburgh, Pa.

**Manufacturing Sites**  
 Chicago, Milwaukee & St. Paul R. R., Chicago, Ill.  
 Southern Railway Co., Washington, D. C.

**Measuring Machines**  
 Rogers, Jno. M. Rod, Gauge & Drill Wks., Gloucester City, N. J.

**Meat Choppers**  
 Brown, Chas. D., 161 Duane St., N. Y.

**Enterprise Mfg. Co. of Pa., Phila., Pa.**  
 Peck, Stow & Wilcox Co., 37 Murray St., New York.  
 Streeter, N. R. & Co., Rochester, N. Y.  
 Woodruff, O. D., Pottstown, Pa.

**Metal Brokers**  
 American Metal Co., 52 Broadway, N. Y.

**Metals**  
 Hendricks Bros., 49 Cliff St., N. Y.  
 Hoteller, Theo. & Co., Buffalo, N. Y.  
 Hungerford, U. T. Brass & Copper Co., 121 Worth St., N. Y.  
 Rutter, A. T., 256 Broadway, N. Y.  
 United Metals Selling Co., 11 Broadway, N. Y.

**Metal Goods Manufacturers**  
 Straight Mfg. Co., Jamestown, N. Y.

**Metal Polish**  
 Hoffman, Geo. W., Indianapolis, Ind.

**Metal Saws**  
 Vandeyck, J. R., 136 Liberty St., N. Y.

**Metal Spinning**  
 Goodwin & Kints Co., Winsted, Conn.

**Metal Wheels**  
 Electric Wheel Co., Quincy, Ill.

**Milling Machines**  
 Adams Co., Dubuque, Iowa.  
 Becker-Brinard Milling Machine Co., Hyde Park, Mass.  
 Brown & Sharpe Mfg. Co., Providence.  
 Carter & Hakes Mch. Co., Winsted, Ct.  
 Cincinnati Milling Mach. Co., Cin. O.  
 Fox Machine Co., Grand Rapids, Mich.  
 Garvin Machine Co., Spring and Varick Sts., N. Y.  
 Niles Tool Works Co., 138-139 Liberty St., N. Y.  
 Shuster, F. B. Co., New Haven, Conn.  
 Thurston Mfg. Co., Providence, R. I.

**Mining Knives**  
 Bishop, Geo. H. & Co., Cincinnati, O.

**Mining Machinery**  
 Allis, E. P. Co., Milwaukee, Wis.  
 Rand Drill Co., 128 Broadway, N. Y.

**Mining Screens**  
 Harrington & King Perforating Co., Chicago, Ill.  
 Howard & Morse, 45 Fulton St., N. Y.  
 Michigan Wire Cloth Co., Detroit, Mich.

**Miter Boxes**  
 Thomson Bros. & Co., Lowell, Mass.

**Molding Machines**  
 Adams Co., Dubuque, Iowa.  
 Maywood Fdry. & Mch. Co., Chicago.

**Motor Fans**  
 Hungerford, U. T. Brass & Copper Co., 121 Worth St., N. Y.

**Motors, Air**  
 Stow Flexible Shaft Co., Phila., Pa.

**Motors, Electric—See Dynamos and Motors, Electric**

**Nail Clippers**  
 Cook, H. C. Co., Ansonia, Conn.

**Nail Machinery**  
 Pittsburgh Mfg. Co., Pittsburgh, Pa.

**Nail Pullers**  
 Hagen & Reid, Troy, N. Y.  
 Scranton & Co., The New Haven, Conn.  
 Smith & Hemenway Co., 236 Broadway, N. Y.  
 Snow, L. T., New Haven, Conn.

**Name Plates, Machinery**  
 Murdock Parlor Gate Co., Boston, Mass.

**Natural Gas Pumps**  
 Norwalk Iron Wks. Co., So. Norwalk, Ct.

**Nickel Platers' Supplies**  
 Eddy Electric Mfg. Co., Windsor, Conn.

**Nickeloid**  
 American Nickeloid Co., Peru, Ill.

**Norway Shapes**  
 Rowland, William & Harvey, Frankford, Philadelphia.

**Nuts—See Bolts**

**Nuts, Self-Locking**  
 National Elastic Nut Co., Milwaukee, Wis.

**Nut Machines**  
 Dunham Nut Co., Unionville, Conn.

**Oil Burning Appliances**  
 Rockwell, Engineering Co., 26 Cortlandt St., N. Y.

**Oil Extractor**  
 Reed & Curtis Mch. Screw Co., Worcester, Mass.

**Oil Heaters—See Oil Stoves**

**Oil Stones**  
 Pike Mfg. Co., Pike Station, N. H.

**Oil Stoves—(See Stoves Oil, Vapor and Gasoline)**

**Oilers**  
 Bay State Stamping Co., Worcester, Mass.  
 Gem Mfg. Co., Pittsburgh, Pa.  
 Hammer & Co., Branford, Conn.  
 Stoutenburg Mfg. Co., Keltshburg, Ill.  
 Wilmot & Hobbs Mfg. Co., Bridgeport, Conn.

**Oilless Bearings**  
 North American Metalline Co., Long Island City, N. Y.

**Ore Breakers**  
 Aultman Co., Canton, O.  
 Cresson, Geo. V. Co., Phila., Pa.

**Ores**  
 Blair, Reed F. Co., Pittsburgh, Pa.  
 Samuel, Frank, Philadelphia, Pa.  
 Wister, Francis, Philadelphia, Pa.

**Ovens, Portable**  
 Blodgett, G. B. Co., Burlington, Vt.

**Ox Shoes**  
 Scranton Forging Co., Scranton, Pa.  
 Woodruff, Walter W. & Sons, Mt. Carmel, Conn.

**Packing**  
 Boston Belting Co., Boston, Mass.  
 Morrison, Robert, St. Louis, Mo.  
 Peerless Rubber Mfg. Co., 16 Warren Street, N. Y.

**Packing, Iron**  
 Smooth On Mfg. Co., Jersey City, N. J.

**Paints**  
 Dixon, Jos. Crucible Co., Jersey City.  
 Standard Paint Co., 77-79 John St., N. Y.

**Pants Stretcher**  
 Covert Mfg. Co., West Troy, N. Y.

**Patent Solicitors**  
 Gorp, L. Paul, 260 Broadway, N. Y.  
 Howson & Howson, Philadelphia and Washington.  
 Stocking, E. B., Washington, D. C.

**Patterns**  
 Balkwill Pattern Wks., Cleveland, O.  
 Norwalk Pattern & Mfg. Co., So. Norwalk, Conn.

**Pattern Letters**  
 Butler, A. G., 108 Beekman St., N. Y.

**Perforated Metal**  
 Clinton Wire Cloth Co., Clinton, Mass.  
 Harrington & King Perforating Co., Chicago, Ill.  
 Hungerford, U. T. Brass & Copper Co., 121 Worth St., N. Y.

**Phosphor Bronze**  
 Hungerford, U. T. Brass & Copper Co., 121 Worth St., N. Y.  
 Phosphor Bronze Smelting Co., Limited, Philadelphia.

**Phosphor Tin**  
 Crescent Phosphorized Metal Co., Philadelphia, Pa.  
 Syracuse Smelting Wks., Syracuse, N. Y.

**Picture Wire**  
 Osawam Mills Co., Norwich, Conn.

**Pig Casting Machines**  
 Hoyt & Patterson, Pittsburgh, Pa.

**Pig Iron**  
 Alabama Consolidated Coal & Iron Co., Birmingham, Ala.  
 Baird, C. R. & Co., Phila., Pa.  
 Cherry Valley Iron Co., Pittsburgh, Pa.  
 Dimmick, J. K. & Co., Phila., Pa.  
 Hickman, Williams & Co., Chicago, Ill.  
 Houston, C. B. & Co., Philadelphia, Pa.  
 Nicoll, B. & Co., 39-41 Wall St., N. Y.  
 Republic Iron & Steel Co., Chicago.  
 Samuel, Frank, Philadelphia, Pa.  
 Sloss-Sheffield Steel & Iron Co., Birmingham, Ala.  
 Snyder, W. P. & Co., Pittsburgh, Pa.  
 Superior Charcoal Iron Co., Grand Rapids, Mich.  
 Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.  
 Virginia Iron, Coal and Coke Co., Bristol, Va.—Tenn.

**Pig Iron Analysis**  
 Church, S. R., San Francisco, Cal.

**Pig Iron Storage**  
 Am. Pig Iron Storage Warrant Co., 4 Wall St., N. Y.

**Pile Drivers**  
 Vulcan Iron Works, Chicago, Ill.

**Pipe, Bent**  
 National Pipe Bending Co., New Haven, Conn.  
 National Tube Co., Pittsburgh, Pa.  
 Whitlock Coil Pipe Co., Hartford, Ct.

**Pipe Coupling**  
 Williams, J. H. & Co., Brooklyn, N. Y.

**Pipe Cutting and Threading Machines**  
 Armstrong Mfg. Co., Bridgeport, Conn.  
 Signal & Keeler Mfg. Co., Edwardsville, Ill.  
 Curtis & Curtis, Bridgeport, Conn.  
 Jarecki Mfg. Co., Erie, Pa.  
 Livermore, Homer F., Boston, Mass.  
 Merrill Mfg. Co., Toledo, O.  
 Saunders' Sons, D., Yonkers, N. Y.

**Pipe Fittings**  
 Crane Co., Chicago.  
 Pittsburgh Valve, Foundry & Construction Co., Pittsburgh, Pa.

**Pipe Grips**  
 Prentiss Vise Co., 44 Barclay, N. Y.

**Pipes, Fittings, &c.**  
 Jarecki Mfg. Co., Erie, Pa.  
 McNeel & Harlin Mfg. Co., N. Y.

**Pipe, Riveted Steel**  
 Follock, W. B. Co., Youngstown, O.  
 Seafie, Wm. B. & Sons, Pittsburgh.  
 Warren City Boiler Works, Warren, O.

**Pipe, Water and Gas**  
 Millar, C. & Son Co., Utica, N. Y.  
 National Tube Co., Pittsburgh, Pa.  
 Re-Jacket Mfg. Co., Davenport, Iowa.  
 U. S. Cast Iron Pipe & Foundry Co., Phila., Pa.  
 Wood, R. D. & Co., Philadelphia, Pa.

**Piston Rods, Tobin Bronze**  
 Ansonia Brass & Copper Co., 99 John St., N. Y.

**Planes**  
 Stanley Rule & Level Co., N. Y.

**Planers**  
 Amer. Tool Works Co., Cincinnati, O.  
 Baird, U. Machinery Co., Pittsburgh, Pa.  
 Cincinnati Planer Co., Cincinnati, Ohio.  
 Detrick & Harvey Mch. Co., Baltimore.  
 Draper Mch. Tool Co., Worcester, Mass.  
 Pond Machine Tool Co., Plainfield, N. J.  
 Whitcomb Mfg. Co., Worcester, Mass.  
 Wilson, W. A., Rochester, N. Y.

**Plated Ware**  
 International Silver Co., Meriden, Ct.

**Plates, Iron and Steel**  
 Jones & Laughlins, Ltd., Pittsburgh, Pa.  
 Lukens Iron & Steel Co., Coatesville, Pa.  
 Singer, Nimick & Co., Inc., Pittsburgh, Pa.  
 Wood, Alan Co., Philadelphia.

**Plate Iron Work**  
 Seafie, Wm. B. & Sons, Pittsburgh.

**Pliers**  
 Bridgeport Mfg. Co., Bridgeport, Conn.  
 Cronk Hanger Co., Elmira, N. Y.  
 Utica Drop Forge & Tool Co., Utica, N. Y.

**Pneumatic Tools**  
 Phila. Pneumatic Tool Co., Phila., Pa.

**Pocket Knives**  
 Cataragus Cutlery Co., Little Valley, N. Y.

**Polishing Wheels**  
 Divine Bros. Co., Utica, N. Y.

**Portable Track**  
 Atlas Bolt & Screw Co., Cleveland, O.

**Poultry Fencing**  
 DeKalb Fence Co., DeKalb, Ill.

**Poultry Nettings**  
 Gilbert & Bennett Mfg. Co., 44 Cliff St., N. Y.  
 N. J. Wire Cloth Co., Trenton, N. J.  
 Tyler, W. S. Co., Cleveland, O.  
 Wright & Colton Wire Cloth Co., Worcester, Mass.

**Power Hack Saws**  
 Hoefler Mfg. Co., Freeport, Ill.

**Power Hammers**  
 Beaudry & Co., Boston, Mass.  
 Bradley Co., Syracuse, N. Y.  
 Dieneit & Eisenhardt, Philadelphia.  
 Dupont Mfg. Co., St. Johnsbury, Vt.  
 Kidder, R. E., Worcester, Mass.  
 Miner & Peck Mfg. Co., New Haven, Ct.  
 Scranton & Co., The New Haven, Conn.

**Power Transmitting Mach'y**  
 Cresson, Geo. V. Co., Phila., Pa.  
 Dodge Mfg. Co., Mishawaka, Ind.  
 Norwalk Iron Wks. Co., So. Norwalk, Ct.

**Pressed Metal Work**  
 Avery Stamping Co., Cleveland, Ohio.

**Presses, Power**  
 Adriance Mach. Works, Brooklyn, N. Y.  
 Bliss, E. W. Co., Brooklyn, N. Y.  
 Cross & Speirs Mch. Co., Waterbury, Ct.  
 Ferracute Mch. Co., Bridgeport, N. J.  
 Hibbard, W. H., Brooklyn, N. Y.  
 Hiles & Jones Co., Wilmington, Del.  
 Keagy & Lear Mch. Co., Cohocton, O.  
 Leffler, Chas. & Co., Brooklyn, N. Y.  
 Manville, E. J. Mch. Co., Waterbury, Ct.  
 Mosberg & Granville Mfg. Co., Providence, R. I.  
 Niagara Machine & Tool Wks., Buffalo.  
 Perkins Machine Co., Boston, Mass.  
 Phila. Machine Tool Co., Phila., Pa.  
 Rudolph & Krummel, Chicago, Ill.  
 Shuster, F. B. Co., New Haven, Conn.

**Price Cards and Holders**  
 Menagh, John S., Jersey City, N. J.

**Projectiles**  
 National Tube Co., Pittsburgh, Pa.

**Rollers**  
 Amer. Pulley Co., Phila., Pa.  
 Dodge Mfg. Co., Mishawaka, Ind.  
 Eastern Machinery Co., New Haven, Ct.  
 Evans, G. F., Boston, Mass.  
 Hess, Snyder & Co., Massillon, O.  
 Jones & Laughlins, Ltd., Pittsburgh, Pa.  
 Saginaw Mfg. Co., Saginaw, Mich.  
 Woods, T. B. Sons, Chambersburg, Pa.

**Pump Chains**  
 Garland Chain Co., Rankin Station, Pa.

**Pumping Machinery**  
 Cook, A. D., Lawrenceburg, Ind.  
 Flier & Stowell Co., Milwaukee, Wis.  
 Goulds Mfg. Co., Seneca Falls, N. Y.  
 Ingersoll-Sergeant Drill Co., 38 Cortlandt St., N. Y.  
 Lake City Engineering Co., Erie, Pa.  
 McGowan, J. H. & Co., Cincinnati, O.  
 Southwark Fdry. & Mch. Co., Phila.

**Pumps**  
 Athol Pump Co., Athol, Mass.  
 Barnes Mfg. Co., Mansfield, O.  
 Deming Co., Salem, O.  
 Edson Mfg. Co., Boston, Mass.  
 Flint & Walling Co., Kendallville, Ind.  
 Goulds Mfg. Co., Seneca Falls, N. Y.  
 Hess, Snyder & Co., Massillon, O.  
 Humphreys Mfg. Co., Mansfield, O.  
 Myers, F. E. & Bro., Ashland, Ohio.  
 Red Jacket Mfg. Co., Davenport, Ia.  
 St. Joseph Pump & Mfg. Co., St. Joseph, Mo.  
 Wilder, S. & Co., Holliston, Mass.

**Punches, Conductors'**  
 Woodman, R. Mfg. & Supply Co., Boston, Mass.

**Punches and Shears, Hand and Power**  
 Bethlehem Foundry & Machine Co., So. Bethlehem, Pa.  
 Bicknell Hdw. Co., Janesville, Wis.  
 Bliss, E. W. Co., Brooklyn, N. Y.  
 Hiles & Jones Co., Wilmington, Del.  
 Mersick, C. S. & Co., New Haven, Conn.  
 New Doty Mfg. Co., Janesville, Wis.  
 Williams, White & Co., Moline, Ill.

**Punching and Shearing**  
 Harrington & King Perforating Co., Chicago, Ill.

**Push Carts**  
 Syracuse Chilled Flow Co., Syracuse.

**Pyrometers**  
 Uehling, Steinbart & Co., Ltd., Carlsbad, N. J.

**Railways, Industrial**  
 Hunt, C. W. Co., West New Brighton, N. Y.

**Rat and Mouse Traps**  
 Burditt & Williams, Boston, Mass.

**Ratchet Drills**  
 Keystone Mfg. Co., Buffalo, N. Y.

**Razors**  
 Buck Bros., Milbury, Mass.

**Razor Hones**  
 Pike Mfg. Co., Pike Station, N. H.

**Reamers**  
 Morse Twist Drill & Mch. Co., New Bedford, Mass.



**Recording Gauges**

Bristol Co., Waterbury, Conn.  
Cohling, Steinbart & Co., Ltd., Carl-  
stadt, N. J.

**Reels**

Hendryx, A. B. Co., New Haven, Conn.

**Refrigerating Machinery**

York Mfg. Co., York, Pa.

**Refrigerators**

Maine Mfg. Co., Naahua, N. H.

**Refrigerator Door Fasteners**

Conroy, F. J., Phila., Pa.

**Registers**

Seavey Mfg. Co., Boston, Mass.

Stowell Mfg. & Foundry Co., So. Mil-  
waukee, Wis.

**Relaying Rails**

Block-Ollak Iron Co., Chicago, Ill.

Donaldson & Newton, Phila., Pa.

Grant & Williams, Park Row Bldg., N. Y.

Isaac Joseph Iron Co., Cincinnati, O.

May & Spalding, Atlanta, Ga.

Steel Rail Supply Co., 190 B'way, N. Y.

**Reloading Tools**

Ideal Mfg. Co., New Haven, Conn.

**Repairing Sets, Family**

Mitchell, W. B., Chicago, Ill.

Star Steel Plate Co., Newark, N. J.

**Repair Outfits, Farmers'**

Imperial Bit & Snap Co., Racine, Wis.

**Revolution Counters**

Pitkin, A. B., Machry Co., Providence.

Tabor Mfg. Co., Elizabeth, N. J.

**Revolvers**

Harrington & Richardson Arms Co.,  
Worcester, Mass.

Johnson, Iver, Arms & Cycle Works,  
Fitchburg, Mass.

**Rheostats**

Electric Controller & Supply Co., Cleve-  
land, Ohio

**Rifles**

Marlin Fire Arms Co., New Haven, Ct.

Remington Arms Co., 315 B'way, N. Y.

Stevens Arms & Tool Co., Chicopee  
Falls, Mass.

**Ring Rollers**

Shuster, Z. B. Co., New Haven, Conn.

**Riveters**

Phila. Pneumatic Tool Co., Phila., Pa.

**Rivets**

American Iron & Steel Mfg. Co., Le-  
banon, Pa.

American Screw Co., Providence, R. I.

Blake & Johnson, Waterbury, Conn.

Burden Iron Co., Troy, N. Y.

Clark & Cowles, Plainville, Conn.

Cobb & Drew, Plymouth, Mass.

Garland Chain Co., Hankin station, Pa.

Lans, W. & Son, Pittsburgh, Pa.

Plymouth Mills, Plymouth, Mass.

Rockford Bolt Works, Rockford, Ill.

Townsend C. O. & E. P., New Brighton  
Pa.

**Riveting Machines**

Bethlehem Foundry & Mch. Co., So.  
Bethlehem, Pa.

Shuster, F. B. Co., New Haven, Conn.

**Rod Mill Machinery**

Bradock Machine & Mfg. Co., Brad-  
dock, Pa.

Morgan Construction Co., Worcester,  
Mass.

**Roll Turning Tools**

Trethewey, Sam'l & Co., Ltd., Pittsburgh

**Roller Bearings**

Roll Bearing Co., Boston, Mass.

Mosberg & Graunville Mfg. Co., Provi-  
dence, R. I.

**Rollers, Road**

Walt, Hurst, E. W. & Co., Norfolk, Va.

**Rolling Mill Machinery**

Booth, The Lloyd Co., Youngstown, O.

Everson, B. M., Pittsburgh, Pa.

Farrell Fdry & Mch. Co., Ansonia, Ct.

Frank-Kneeland Mach. Co., Pittsburgh

Garrison, A. Foundry Co., Pittsburgh

Meeta Machine Co., Pittsburgh, Pa.

Morgan Construction Co., Worcester,  
Mass.

Mosberg & Graunville Mfg. Co., Provi-  
dence, R. I.

Penna. Engineering Wks., New Castle,  
Penna.

Totten & Hogg Iron & Steel Fdry. Co.,  
Pittsburgh, Pa.

**Rolls, Chilled, Sand and Steel**

Birmingham Iron Fdry., Derby, Conn.

Booth, The Lloyd Co., Youngstown, O.

Farrell Fdry & Mch. Co., Ansonia, Ct.

Frank-Kneeland Mach. Co., Pittsburgh

Garrison, A. Foundry Co., Pittsburgh

Meeta Machine Co., Pittsburgh, Pa.

Morgan Construction Co., Worcester,  
Mass.

Mosberg & Graunville Mfg. Co., Provi-  
dence, R. I.

Penna. Engineering Wks., New Castle,  
Penna.

Totten & Hogg Iron & Steel Fdry. Co.,  
Pittsburgh, Pa.

**Roofs, Copper**

Hungerford, U. T., Brass & Copper Co.,  
121 Worth St., N. Y.

**Roofing and Siding**

Asphalt ready roofing Co., 136 Water  
St., N. Y.

Garry Iron & Steel Roofing Co., Cleve-  
land, O.

Scaife, Wm. B. & Sons, Pittsburgh

Standard Paint Co., 77-79 John St., N. Y.

Youngstown Iron & Steel Roofing Co.,  
Youngstown, O.

**Rope and Cordage**

American Mfg. Co., 65 Wall St., N. Y.

Waterbury Rope Co., 40 South St., N. Y.

**Rope and Web Goods**

Covert Mfg. Co., West Troy, N. Y.

**Rope Shield**

Rosides Co., Columbus, Ohio

**Rope Transmission and Hoisting**

American Mfg. Co., 65 Wall St., N. Y.

California Wire Works, San Francisco

Hunt, G. W. Co., West New Brighton,  
N. Y.

Leschen, A. & Sons, Rope Co., St. Louis

Worrie T. B. Sons Chambersburg, Pa.

**Rubber Goods**

Boston Belting Co., Boston, Mass.

Candfield, H. O., Bridgeport, Conn.

Feenlow Rubber Mfg. Co., 50 Warren  
Street, N. Y.

Rubber Scrap

Hofeller, Theo. & Co., Buffalo, N. Y.

**Rules**

Lufkin Rule Co., Saginaw, Mich.

Stanley Rule & Level Co., 29 Chambers  
St., N. Y.

**Sad Irons**

Enterprise Mfg. Co., Phila., Pa.

Williams, A. C., Ravenna, O.

**Sand Blast Apparatus**

Ward, Edgar T. & Sons, Boston, Mass.

**Sand Paper**

Baeder, Adamson & Co., Phila., Pa.

**Sash Balances**

Caldwell Mfg. Co., Rochester, N. Y.

Fullman Sash Balance Co., Rochester,  
N. Y.

Streeter, N. R. & Co., Rochester, N. Y.

**Sash Cords and Chains**

Bridgeport Chain Co., Bridgeport, Conn.

Morton, Thos., 65 Elizabeth, N. Y.

Samson Cordage Works, Boston, Mass.

Silver Lake Co., Boston, Mass.

Smith & Egge Mfg. Co., Bridgeport

**Sash Locks**

Fitch, W. & E. T. Co., The, New Haven,

**Sash Pulleys**

Box Machine Co., Grand Rapids, Mich.

Grand Rapids Hardware Co., Grand  
Rapids, Mich.

Palmer Hardware Mfg. Co., Troy, N. Y.

**Sash Weights**

Barney & Reed Mfg. Co., Boston, Mass.

Brown, E. E. & Co., Philadelphia, Pa.

**Sashes, Metal**

Smith-Warren Co., E. Cambridge, Mass.

**Sausage Stuffers**

National Specialty Mfg. Co., Phila., Pa.

**Saws**

Adkins, E. C. & Co., Indianapolis, Ind.

Blahop, Geo. H. & Co., Cincinnati, Ohio

Dixon, Henry & Sons, Inc., Phila., Pa.

National Saw Co., Newark, N. J.

Simonds Mfg. Co., Fitchburg, Mass.

**Saws, Metal**

Vandeyck J. R., 136 Liberty St., N. Y.

**Saw Clamps**

Dixon, Henry & Sons, Inc., Phila., Pa.

**Saw Guides**

Thomson Bros. & Co., Lowell, Mass.

**Saw Handles**

Ladd, W. C., Bristol, Conn.

**Saw Sets**

Dixon, Henry & Sons, Inc., Phila., Pa.

Smith & Hemenway Co., 236 B'way, N. Y.

Taintor Mfg. Co., 9 to 15 Murray, N. Y.

**Saw Tools**

Adkins, E. C. & Co., Indianapolis, Ind.

**Scales**

Chattillon, John & Sons, 85-89 Cliff, N. Y.

Chicago Scale Co., Chicago, Ill.

Osgood Scale Co., Binghamton, N. Y.

Pelouse Scale & Mfg. Co., Chicago, Ill.

Standard Scale & Supply Co., Pittsburgh

**Scrap Metals**

Armstrong, E. S. & Bro., Atlanta, Ga.

Atlanta Junk Co., Atlanta, Ga.

Blake, M. J. & M., 11th Ave. and 13th  
St., N. Y.

Botcher, C., Hoboken, N. J.

Green, Thomas, Brooklyn, N. Y.

Gretner, F., Philadelphia, Pa.

Hitner, H. A. & Sons, Phila., Pa.

Hofeller, Theo. & Co., Buffalo, N. Y.

Kennedy, L. E. & Co., 93 Liberty St.,  
N. Y.

Leaf, E. B. & Co., Philadelphia, Pa.

Leonard, John & Co., 32 Broadway, N. Y.

N. J. Iron & Metal Co., Paterson, N. J.

Phillips, F. R. & Sons Co., Phila., Pa.

Rogers, W. H., Bridgeport, Conn.

Samuels, M. Sons, Brooklyn, N. Y.

Smith, Morton B. Co., New York

**Scrapers, Road**

American Steel Scraper Co., Sidney, O.

Atlanta Junk Co., Atlanta, Ga.

Kilbourne & Jacobs Mfg. Co., Colum-  
bus, Ohio

Sidney Steel Scraper Co., Sidney, O.

Syracuse Chilled Plow Co., Syracuse

**Screens, Perforated Metal**

Harrington & King Perforating Co.,  
Chicago, Ill.

**Screens, Window and Door**

Daroy, Edw. & Sons, Philadelphia, Pa.

**Screw Cutting Dies**

Card, S. W. Mfg. Co., Mansfield, Mass.

Geometric Drill Co., Westville, Conn.

Rogers, Jno. M. Best Gauge & Drill  
Wks., Gloucester City, N. J.

Wells Bros. & Co., Greenfield, Mass.

Wiley & Russell Mfg. Co., Greenfield,  
Mass.

**Screw Drivers**

Braunsdorf-Mueller Co., Elizabeth, N. J.

Brown, H. H. & Co., New Haven, Conn.

Goodell-Frost Co., Greenfield, Mass.

Mayhew, H. H. Co., Shelburne Falls,  
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North Bros. Mfg. Co., Philadelphia, Pa.

Sawyer Tool Co., Fitchburg, Mass.

Union Mfg. Co., Buffalo, N. Y.

**Screw Machine Products**

Dodge Machine Screw Co., Boston, Mass.

**Screw Machinery**

American Tool Wks. Co., Cincinnati, O.

Brown & Sharpe Mfg. Co., Providence

Draper Mach. Tool Co., Worcester, Mass.

Garvin Machine Co., Spring and Varick  
Sts., N. Y.

Jones & Lamson Mch. Co., Springfield, Vt.

Windsor Mch. Co., Windsor, Vt.

**Screws**

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Hall & Sam'l Sons, 229 West 10th St., N. Y.

Haskell, Wm. H. Mfg. Co., Pawtucket, R. I.

Machine

American Screw Co., Providence, R. I.

Blake & Johnson, Waterbury, Conn.

Chicago Screw Co., Chicago, Ill.

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Hubbell, Harvey, Bridgeport, Conn.

Illinois Screw Co., Chicago, Ill.

Miles, F. S., 205 Quarry, Philadelphia

Niagara Screw Co., Buffalo, N. Y.

Phila. Mach. Screw Wks., Phila., Pa.

Pittsburgh Screw & Bolt Co., Pittsburgh

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Reed & Curtis Mch. Screw Co., Worcester,  
Mass.

Rhode Island Tool Co., Providence, R. I.

**Worcester Mch. Screw Co., Worcester.**

Wood

American Screw Co., Providence, R. I.

Franklin Moore Co., Winsted, Conn.

Reading Hardware Co., Reading, Pa.

Reading Screw Co., Norristown, Pa.

**Scroll Saws**

Barnes, W. F. & John Co., Rockford, Ill.

Millers Falls Co., 28 Warren St., N. Y.

Seneca Falls Mfg. Co., Seneca Falls, N. Y.

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